Indian Educational System :
The Role of Computers
ARUN K. GUPTA

Reading Readiness and Learner
MARLO EDIGER

Status of Science Education in India
H.C. JAIN

Work Education in India :
Experiences and Plans
A.K. DHOTE

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CONTENTS

TO OUR CONTRIBUTORS

JIE invites articles/papers on the impact of educational research on classroom practices, policy decisions. Specific examples where this impact is apparent may be given.

GENERAL EDITOR

Indian Educational System : The Role of Computers

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Educational systems the world over are witnessing, today, the onslaught of modern technology in the shape of computers. Never since the invention of printing or industrial revolution has the school system come to terms with a powerful development like this. Computers (including personal and micro-computers, micro-processers, hand calculators and other devices based upon chip technology) are changing the whole face of school as we know it. Even though other sectors like transport, commerce, defence, management, industry, science, etc. have considerably changed owing to the impact of computers in our country, yet, the discipline of education has somewhat been slower in responding to the computer technology Nonetheless, the time has come when we should no longer remain passive onlookers in the light of immense potential of computers in the field of education.

The Need

In India, we have rarely considered seriously the use of computers in our educational situations, primarily because of the exhorbitant costs involved and secondly, because it is inbuilt in the thinking process of our administrators, educators and planners that ours is a poor country, and that we can ill-afford such a luxury. Besides, due to genuine paucity of support services for the hardware and software in the country, we have also been feeling inferior as far as technical sophistication in the field is concerned. However, with a dramatic reduction in the costs of computers and processors during the past few years and owing to the rapid strides made by the computer industry in India, the time seems to be ripe for us to consider seriously the importance of the role of the computers in our educational system.

The Indian educational system has gigantical proportions. By the year 1981, our country had about 148 universities (including institutes of national importance), 4,800 colleges, 40,000 secondary schools, 6,50,000 elementary schools, 36 lakh teachers and 10 crore students (including 29 lakh studying in colleges and universities) with governmental expenditure of Rs. 3,800 crore per annum with plans to enroll 200 mlllion adults and children at different stages of education in the coming decade. We have embarked upon an ambitious programme of educational reconstruction aiming at (1) transformation of the educational system so as to relate it to the life, needs and aspirations of the nation; (2) qualitative improvement of education to raise standards; and (3) expansion of educational facilities in the light of manpower needs and based on equalization of educational opportunities. Obviously, the task of transforming the tradition-bound society into a progressive and dynamic society receptive to the calls of the time and utilizing latest trends in science and technology is the need of the hour. Considering the huge dimensions of our system, the use of computers is considered essential for dealing with the large mass of data and to undertake complex analyses taking shortest time for operational ease and ensuring the effectiveness of the system. For example, the time taken for operations in modern computers has been reduced from mili-second (i.e. thousandth's of the second) to nano-second (i.e. billionth's of a second), which is quite something beyond our power to imagine even. The implications of this are dazzling.

The Scope

In fact, there is no sphere of education in which computers cannot be used and with efficiency. From the pre-school to the university level, whether it is educational planning, curriculum development, pupil intruction, guidance and counselling, item and test construction, educational documentation, scoring of tests and processing of educational results, educational administration, supervision, financing, conducting of educational surveys and forecasting, managing gifted and handicapped children, sifting and retrieving of information, there is hardly any field in which computers cannot be used with profit. Not to say of formal schooling, in the non-formal channels like distance education, tele-education, non-formal studies, continuing education, worker's education, technical education, training of atheletes, education of the adults, computers have been and can be utilized with full advantage. A few illustrations should substantiate this.

Educational Planning

Let us take the domain of educational planning, management, and administration. Some of the problems which are a perennial source of headache for all planners and administrators are postings and transfers, maintenance of accounts, pupil flow rates, estimates of wastage and stagnation, planning and budgeting, monitoring and supervision. The use of computer can bring the much-needed relief in these areas. At the touch of a finger, data regarding the above aspects can be retrieved and necessary decisions taken. The immense and time-consuming file work, statistical work and the task of obtaining updated knowledge at a short notice are taken care of. To illustrate, the capabilities of a modern computer can crunch into a mere 4.8 minutes, the output equivalent to an individual's entire working life of say 80,000 paid hours at the rate of 2,000 hours per year for 40 years.

The necessary records concerning personnel, their background data, previous places of service, excerpts from necessary reports can

be computerized and stored for any future reference. Thus, the time lag for decision-making and action programmes can be considerably shortened. This would greatly enhance the efficiency of the whole administrative machinery.

Examinations

The field of examinations is another domain in which computers can be used with great advantage. Whether it is item banking, question banking, scoring of tests; distribution analyses of the scores obtained by the different target groups with respect to several background variables, diagnostic testing, item analysis, marks sheet preparation, printing or result gazettes and analysis of results, computers can help us to undertake all these jobs. With sub-terminal facilities whereby several consoles can be hooked to a central computer system, every school can have access to the stored data. A major reform in the examination system can be achieved through this. Many Boards and Universities in India including the NCERT, the UPSC, the UGC, and the All India Association of Indian Universities have been using computers for streamlining various aspects of examinations in the above areas. However, the time has come when these benefits should filter down to the school and college level, i.e. the grassroot level.

Educational Research

In the field of educational research, computers have been used for many years in India even though their use has mostly been for data processing in statistical terms. The availability of modern multivariate statistical techniques like factor analysis, regression analysis, discriminant functions, analysis of factorial design of analysis of variance and analysis of covariance. Canonical correlations path and casual analysis can be used with ease. This has resulted in the sophistication of research methodology. Also, performing of complex analyses in the shortest possible time has become a possibility.

Documentation, Guidance and Counselling Services

In the task of providing documentation, guidance and counselling services, computers have been found ideal for sifting information and for providing references at a glance which are invaluable for the survey of studies on a particular topic. The work of research scholars has become much simplified and valuable time is saved. Word processing facilities can help obtain printed quality reports and texts in significantly shorter time. For example, we now have computer-operated micro-printers capable of printing 10,000 to 20,000 lines per minute. In the field of guidance and counselling, the use of computers in our country is in its infancy for the simple reason that the guidance and counselling services themselves are not well-organized. Nonetheless, in the important task of matching individual assets and liabilities with that of the requirements in different vocational fields, computer can be of immense use. A data bank based on scientific information can be created whereby objective and reality-based guidance and counselling can be provided to the students and aspiring youths. Considering that in India unemployment is one of the major problems, there being 22 million people unemployed and the fact that our government is spending a huge amount of money in solving this problem, taking recourse to computers can be considered a very sound investment towards solving the problem of unemployment in the present day context.

Student Learning

It is, however, in the case of student learning that the use of computers has increased in recent years especially in the developed countries. Today, computer-based instructional

systems have come to stay in schools, colleges and universities in which pupils can learn what they want to learn, at their own pace and according to their own time availability. A good deal of remedial teaching based on effective diagnosis is also made possible through the computer-assisted and managed instruction. By following principles of educational technology and programmed instruction, maximal pupil gains can be achieved through the individual-centered approach. This has been found to be cost-effective when used over larger numbers. Since over-crowding of classrooms is assuming critical proportion in our country and individual attention is decreasing, it is felt that computer-assisted instructional systems should be introduced in our educational system to compensate for the lacklusture instructional programme at different levels of education.

When computer is programmed to present a series of instructions to a student or a group of students, we can have a "computer-managed instruction" (CMI). In CMI, the information is fed to the computer by means of a programme and the computer delivers instrutions to the students. The media of delivering instructions can be voice (by means of a set of headphones) or TV screen display or a printer and also through a wired or a wireless connection. A student reads the instructions and feeds his responses to the computer. A punched card or coded audio-tape or simply recorded audio-input is used to feed this information. The computer which is programmed for this particular instruction, processes the responses, evaluates them and records the results. It may also comment on the answers given by the students.

Leisure-time Activities and Vocational Training

The educational use of computer does not end here. Computer can be of immense use in simulation. Simulation enables experts to incorporate changes in a particular (imaginary) situation and to study their probable impact on various factors. In practice, it would take a long time, efforts and resources if such changes are introduced and their effects studied in practical situations. Subsequently, changes can be introduced with minimum wastage. Besides simulation, computer can be a source of great pleasure for the leisure-time utilization of the students. There are programmes available for a variety of educational games in which pupils can sharpen their reaction times and improve upon their abilities and skills which are central to several activities and whereby their aptitudes can be known in advance. These opportunities provide very engrossing, useful and practical leisure-time avenues for the students. Not only that, the latest news can be flashed through the computer on the TV screen. Knowledge of the latest in any field can be had and a great fillip given to pupil learning through informal and indirect means (incidental learning). Computer can be used for establishing a national hook-up for various target groups. In tele-conferencing, experts from various countries can participate through a satellite and computer combination in educational discussions sitting in their own offices without ever travelling from one place to another. For the handicapped and exceptional children and youth, computer can be used to provide specialized training with success. This would otherwise require a large degree of repetition and effort. Experiments are being conducted on how computers can be used for providing vocational training to people in their own working places. The 'Teledon' experiment conducted in Canada can be cited as an importan development in this area.

Computer Education

Thus, it can be seen that computers in educational situations promise the much-needed help,flexibility and relief to the teachers, administrators, researchers and centres of learning. And their use is likely to increase with time. In fact, educationists in the developed countries have realized that all children at the time of leaving schools must have the basic understanding of computer technology and familiarity with key-board skills. Since computers are destined to play such an important role in our lives, it is apposite that the coming generations must be educated in this important field. Computer education, in other words, has to be provided.

Computer education has emerged today as an independent discipline — one that may be taught at different levels. Computer education also incorporates the concepts of computer awareness and computer literaey. It includes everything concerning the use of computer as a tool of teaching and learning in different disciplines. Educationists in the developed nations today are actively discussing the introduction of the subject of computer education in the regular school curriculum, keeping in view the increasing use of computers in all walks of life. In the United Kingdom, for example, every secondary school has at least one micro-computer and many have between 5 and 10 computers. There is a plan to equip every primary school in Britain with a micro-computer.

There is, however, a good deal of controversy regarding the fitting of this subject into the already over-crowded school time-table and about the age-level at which this subject should be introduced. Similarly, opinions are divided as to whether less-sophisticated and cheaper hardware or relatively expensive equipment should be supplied. The training of teachers in computer education is another issue to be sorted out. Coupled with the above, are the important issues of keeping abreast with the latest information technologies ; problems of the software, its development, standardization, marketing and diversification. Nations are nonetheless seized of these and allied issues and are in their own ways, introducing the subject for different target groups in view of their own peculiar circumstances, resources and needs. They are even engaged in formulating 'national' policies on computer use so that future developments in the area can be ensured.

To sum up, it has to be realized that computer education or, for that matter, spread of computers in educational spheres in our country will not automatically get accepted. Nor can any foolproof plan be developed in advance for the same. Nonetheless, persistence initiative and some bold thinking followed by concrete actions are req uired at the hands of innovators and planners so that basic steps can be taken to catapult our coming generations into the twenty-first century — the era of "intelligent" computers. This is not only going to be a promising challenge but also a thrilling experience. □

Reading Readiness and the Learner

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A QUALITY reading readiness programme needs to be in the offing for each student beginning initial experiences in reading.

A reading readiness programme for young learners needs to be sequential to blend into more formalized means of reading instruction. A quality reading readiness curriculum will emphasize :

1. Securing the interests of learners.
2. Achieving meaning in learning on the part of students.
3. Providing for diverse levels of achievement among pupils.
4. Attaining purpose from the involved student's own unique perception.
5. Developing appropriate attitudes within students for learning.
6. Utilizing a variety of meteriais and methods to optimize student achievement.

Securing Interests of Learners

What cane be done to obtain the attention of students in order that they may achieve as much as possible in reading? A variety of learning activities certainly should assist in securing interests of students. Thus, selected slides, filmstript, pictures, study prints, films, and transparencies can provide background information for learners in a reading readiness programme. The act of reading in a more formalized programme of intruction becomes easier if learners understand the related subject-matter. If students struggle over both word recognition and ideas in reading a given selection, the skill of reading becomes complex lndeed. However, with background information provided by quality audio-visual materials, properly introduced by the teacher, reading as a skill can be more

readily developed, as compared to not knowing the meaning of the inherent subject-matter. It becomes quite obvious that more than background information on the part of the learner is needed to acquire abilities in learning to read.

Achieving Meaning in Learning

Young learners in a reading readiness programme need to understand the meaning or meanings of abstract symbols. Thus, even in getting learners ready to read, students may already receive practice in understanding content which contains graphemes (symbols) arranged in sequential words, phrases, sentences, and even paragraphs. The experience chart concept may well provide this practice.

To implement the experience chart concept, involved learners need background experiences. The previously discussed audio-visual materials can provide the framework for these background experiences. Also, excursions in the school building, on the playground area, and near to the school grounds may be taken by students with teacher guidance. The excursion experiences may be given orally by involved learners to the teacher in the classroom. The teacher prints neat, large manuscript letters pertaining to content provided by students. The content may be printed on the chalkboard, on a chart, or on a transparency using an overhead projector.

Next, after the completion of the experience chart in which students can see talk written down, the teacher guides students to read the related subject matter. As the teacher points to words, phrases, and sentences, students are developing a basic sight vocabulary.

Meaningful learning accrue in developing an experience chart due to students having :

1. experienced content contained in the chart.
2. observed their orally expressed ideas being encoded using related graphemes.
3. provided the content which is within their very own speaking vocabularies.
4. experienced reading of content which they provided for the resulting chart.

Pertaining to the utilization of experience charts, Lee and Allen[1] wrote :

> Communication skills, commonly called the language arts, occupies a larger part in the curriculum during the first twelve or thirteen years of basic education than any other curriculum element. In fact, development of communication skills begins very early in the home as the child learns to use his native language with some digree of effectiveness. Our society recognizes, however, that skillful use of the language in all its aspects requires years of instruction and practice. Ability to use language well is closely linked with success in most prestige occupations in our society. It is imperative, then, that we effectively and efficiently teach the communication skills of listening, speaking, reading and writing.

Providing for Diverse Levels of Achievement

It is always important to provide for varied levels of accomplisment on the part of a given set of learners. Pupils differ from each other in many ways, such as interest, motivation, abilities, and needs. How can the teacher provide for these differences in a quality reading readiness programme?

The teacher might utilize a flannel board with related cutouts to tell a sequential story, An experience such as this should assist learners to attain background knowledge, as well as think of order of content stated. Each story that pupils will read later in a formalized reading curriculum should contain recommended sequence. Human beings tend to think sequential as to facts, concepts, and generalizations. A quality story told to young learners with visuals should assist in providing learning emphasizing sequence in reading readiness.

Pupils may also tell stories without or with the use of a flannel board. The story should be on the present achievement and understanding level of the involved learner.

A second approach in providing for diverse progress levels could involve oral reading of stimulating stories to students. The content needs to be carefully selected to capture the interests of involved pupils. Illustrations contained in the context may be shown to learners as the oral reading activity progresses. The teacher needs to observe listeners to notice attentiveness. Reading orally with enthusiasm and intonation is important.

Using commercially prepared reading readiness materials may also assist in providing-for individual differences. Selected learners may proceed more rapidly than others in the classroom due to abilities and motivation possessed. Thus, on a reading readiness page, learders may draw a line to match upper and lower manuscript letters. Visual discrimination is then being emphasized. Learners notice likenesses and differences in letters Each upper case letter has a different configuration. Upper case letters, of course, have a different appearance, one from the other, as compared to lower case manuscript letters. Thus, the upper case letter 'A' is quite different in appearance from the lower case 'a'. The upper case 'C' is taller than the lower case letter 'c'. Otherwise the upper case and lower case 'C', appear quite similar in appearance. In utilizing commercially prepared reading readiness materials, the teacher needs to make difinite provisions for individual differences among learners.

Individual difference also can receive adequate attention in teacher prepared readiness materials. Thus, a teacher may have learners engage in activities, such as the following to proceed at their own rate of achievement :

1. Cross out a word that looks different from two other words, e. g., dog, room, dog. From the simple to the complex in sequence should be the guide in developing the visual discrimination experiences for students in marking the word in print that is different from two other words.
2. Choose the picture that looks different from two other illustrations, e.g., pictures of two identical dogs and a picture of a boy.
3. Pick the letter that is different, e.g., a b b.

In providing for individual differences, each learner needs to be permitted to attain as rapidly as abilities permit. No learner should be held back to where others are achieving. Nor should students be hurried along to a point to which meaningful learning is not possible.

Purpose in Learning

What can be done to assist students to attach reasons for participating in ongoing experiences? Learners achieve at a higher rate if a reason or reasons are involved in learning subject matter, skills, and attitudes. In a quality reading readiness programme, pupils may engage in learning to read words attached to relevant concrete objects in the classroom. Thus, the word 'chair' should be printed in neat manuscript letters and attached to a real chair and the word 'table' placed on a real table. Other vital words need also to be printed and placed on concrete objects. It is recommended that words in manuscript need selecting (and placed on objects) which will aid students later on in reading significant words in a more formal programme. Each pupil needs to read at an increasingly proficient level.

Explaining to students how in learning to read the labeled words will aid them in read-

ing more complex materials is significant.

The Dolch[2] list of 220 basic sight words remain relevant for students today. The 220 words are :

a	as	blaek	cold	eat	for	grow	how
about	ask	blue	come	eight	from	had	hurt
after	at	both	could	every	full	has	I
again	ate	bring	cut	fall	funny	have	if
all	away	brown	did	far	gave	he	in
always	be	but	do	fast	give	help	into
am	because	by	does	find	go	her	is
an	been	call	done	first	goes	here	it
and	before	came	don't	five	going	him	its
any	best	can	down	fly	good	his	jumps
are	better	carry	draw	for	got	hold	just
around	big	clean	drink	found	green	hot	keep
kind	must	open	right	small	there	us	which
know	my	or	round	so	these	use	white
laugh	myself	our	run	some	they	very	who
let	never	out	say	soon	this	walk	why
like	new	over	saw	start	those	want	will
little	no	own	say	stop	three	warm	wish
live	not	pick	see	take	to	was	with
long	now	play	seven	tell	today	wash	work
look	of	please	shall	ten	together	we	would
made	off	pretty	she	thank	too	well	write
make	old	put	show	that	try	went	yes
many	on	ran	sing	the	two	were	you
may	once	read	sit	their	under	what	your
me	one	red	six	them	up	when	
much	only	ride	sleep	then	upon	where	

The teacher may desire to select a few of the words at chosen intervals to guide learners in achieving word recognition skills. The teacher may challenge students to master the words using a flashcard approach. Inexpensive prizes or certificates may be given for mastery learning. The number of words selected for students to master should not be excessive. Rather, the number selected is reasonable and can become a part of the basic sight vocabulary of each learner. Success in learning and positive attitudes developed by each student is vital. If learners develop negative side effects from ongoing activities, harmful end-results in learning to read will be in the offing. Continuous progress from each learner is recommended. To attain continuously, each student needs to be successful in learning and thus achieve what is impossible to learn will definitely hinder in developing positive attitudes toward learning.

Developing Appropriate Attitudes

If learners are to achieve appropriately, quality feeling toward learning need adequate emphasis. Playing games which aid students in achieving vital goals may emphasize affective ends. In a quality auditory discrimination programme, pupils may provide words

which rhyme with a given word provided by the teacher. Appropriate words need to be selected for this activity. How many words can students then give which rhyme with 'hat'. The word lends itself to learners giving numerous rhyming words such as bat, cat, fat, mat, vat, and rat. Other words which the teacher might use in a game situation in determining how many rhyming words pupils can provide include : can, ball, and run.

When students suggest words that rhyme, not only do auditory discrimination goals become relevant in the reading curriculum, but also enjoyment of learning as an attitude is relevant.

Pupils can also be challenged to provide words which have the same beginning sound as a word provided by the teacher. Thus, when ready, pupils may give words which have the same beginning sound as each of the following : bay, cake, role, and do.

There are students who cannot hear sounds and may need to depend upon the sight method more so then the sound approach to identify unknown words in a sequential reading programme.

Pictures may also be used in a quality auditory discrimination lesson or unit. For example, the involved learner may cross out which picture of an animal does not begin in sound like the other two illustrations : baby fox, and boy.

Bush and Huebner[3] wrote :

1. Auditory and visual discrimination must be blended. From words that the child recognizes when he hears them, he is taught to recognize them when he sees them. Thus, he blends the auditory and the visual processes.
2. The teacher should illustrate a particular sound with as many words as possible. Words and pictures should be used together for reinforcement and association. With the use of pictures, children can furnish additional words illustrating the particular sound.
3. Reliance upon only one method of word analysis is wrong. All the clues should be brought into play,
4. Teachers should direct to the individual child questions that will help him or her analyze the letter-sound relationships. Children vary in this ability and in the ability to generalize from specifics.
5. All elementary teachers should be familiar with the entire phonics programme. No matter what grade or level is taught, there must be teaching, practice, reteaching, and review of certain phonic skills, at least with some of the children.
6. Some children need little phonic instruction. Substituting sounds in familiar words or adding sound to familiar words may suffice for them. Examples of substitution are ban for the known can, or bat for known cat. Examples of adding a sound are farm where arm is known, or rant when ran is known.
7. By diagnosing the strengths and weaknesses of the class, the teacher determines how much time to spend on phonics and with which children phonic instruction and practice is needed. It is usually a waste of time to teach the whole class or group that which only a few need.

Utilizing varied Media

Quality reading readiness curriculum must emphasize a variety of materials and methods of teaching and learning. Each learner differs from others in many ways. Since multiple differences exist among students, each learner needs to be adequately provided for to achieve in a optimal manner.

Objectives need to be carefully chosen for students to attain on an individual basis. The types of objectives emphasized should

reflect the concept of balance in the reading curriculum. Thus, understandings, skills, and attitudinal ends should be emphasized in teaching-learning situations. To attain understandings goals, vital facts, concepts, and generalizations should be stressed for learner attainment. Skills ends emphasize a learning by doing approach. A student then achieves abilities in using visual discrimination skills (developing a basis sight vocabulary), auditory discrimination methods (phonetic analysis), and picture clues (illustrations utilized to identify unknown words.) Attitudinal ends are equally significant to achieve as compared to understandings and skills goals. Quality attitudes emphasize positive feelings toward reading as a curriculum area. With improved attitudes, students achieve at a more optimal rate in reading.

In Conclusion

Teacher and supervisors need to follow selected standards in a quality reading readiness programme. Thus, an exemplorary curriculum in securing a student's abilities to be ready to read include ;

1. Getting learners' interests (attention) in desiring to achieve skills in reading.
2. Attaching meaning (understanding) to content being studied in a reading readiness programme.
3. Providing for each student's present level of achievement with emphasis being placed upon sequential progress in reading for pupils,
4. Guiding pupils to perceive purpose or reasons for wanting to learn to read.
5. Assisting learners to develop positive attitudes toward the curriculum area of reading.
6. Using diverse kinds of learning activities in guiding learners to achieve optimally. □

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Status of Science Education in India

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MAHATMA GANDHI said, "By Education I mean an all-round drawing out of the best in child and man—Body, Mind and Spirit". Science education is no exception to this. Pandit Jawaharlal Nehru, therefore, involved Prof. Meghnad Saha, the leading physicist, in the National Planning Committee. Prof. Shanti Sarup Bhatnagar and Dr. Homi Bhabha also played a key role. In 1958, the Government of India adopted a Science Policy Resolution according to which science was an instrument of economic development and had a far-reaching cultural role in transforming the attitudes and outlook of the people by creating a scientific temper. With the passage of time, science education is becoming more and more a concern not only of the Central agencies like the NCERT at the school level and the UGC at the College level, but of scientists, educationists, industrialists and society as well. However, our country with a population of about 70 crores and diversified cultural, social, and economic backgrounds is yet to develop quality science education programmes which can reach the masses and improve their quality of life significantly.

Structural Pattern

Education is a state subject. The structure of school education varies from state to state and is passing through a process of change. These few states still following the 8+3 or 8+4 pattern are also gradually switching over to the 10+2 pattern as recommended by the Education Commission (1964-66). In the 8+3 or 8+4 system, science is taught as a compulsory subject up to the primary stage (i.e. Class V) in the name of elementary science, natural study. general science or

health, hygiene and physiology. From Class VI to VIII, known as the middle school stage, general science forms an integral part of the curriculum. After Class VIII, in the 8+3 system, there is 2-year schooling known as secondary and thereafter one-year known as higher secondary. In the 8+4 system, there is two-year schooling after Class VIII known as High School and then further two-year schooling known as Intermediate. Regarding science teaching, different practices exist in different states at the +3 or +4 stage after Class VIII. In some states science is taught as an optional subject, whereas in other states, it is taught as compulsory general science to all students. In still other states, the subject is taught to all students as compulsory general science and also as elective science to those who offer it as an optional subject.

In the above schemes, the time alloted for science teaching at various levels varies from state to state. At the primary stage, it varies from 5 per cent to 15 per cent of the total school time. Correspondingly, the time alloted at the middle and the higher secondary stage is from 6 per cent to 16 per cent and 9 per cent to 14.3 per cent, respectively. At the primary stage, the topics covered are general studies regarding plants, air, water, animal, plant and human life. At ths middle stage, the topics are drawn from physics, chemistry, biology, physiology and hygiene. At the higher secondary or intermediate stage, the study of science is in the form of disciplines like physics, chemistry and biology. After higher secondary and intermediate stages, there is a three-year and a two-year degree course, respectively, followed by two-year post-graduate specialization in one particular subject. At the degree level, known as the B. Sc. course, the topics covered are drawn from different areas of the subjects which are again taught in the form of separate disciplines.

With the above schemes in mind, the Education Commission (1964-66) felt that it was too early for a child at the age of 13 years after middle school to exercise the option for any of the disciplines—Arts, Science or Commerce. Besides, whether the child comes from a rural or urban background, he is to be given some basic minimum knowledge of science in view of the increasing role of science and its application in rural as well as urban life. Accordingly, the study of science was made compulsory up to Class X and as the child was exposed to work experience as well by now he could opt either for the academic or vocational stream at the +2 level known as the higher sceondary stage. The time alloted for instruction in science and mathematics at the Class IX and X level (known as the lower secondary stage) is 12 periods, each of about 40 minutes, per week, out of a total 48 instructional periods. Most of the states have adopted this pattern of schooling. Others have initiated and it is expected that shortly all of them will have this uniform pattern of school education.

Agencies and their Role

Agencies working at various levels for transforming science education programmes into reality are the UGC at the central level for university education, the NCERT at the central level for school education and the SIEs, SCERTs at the state level againg, for school education. In relation to science teaching the UGC has been running mainly two programmes—COSIP (College Science Teaching Improvement Programes) and ULP (University Leadership Projects). About 175 colleges in the country are involved in the COSIP programme and 36 universities in the ULP programme out of which 13 are working for the physics teaching improvement programme. The Universities of Rajasthan, Andhra

Pradesh and Mysore are particularly involved in the a programme. Their main work is directed towards fabricating and assembling new experiments, orienting college teachers by organizing summer institutes, preparing laboratory guides, question banks and model question papers. University staff and college teachers also take up joint research projects.

At the school level, the NCERT work as an advisory body to the states. Being a national body its activities in relation to science teaching are directed towards promoting research in science education, developing curricula, writing textbooks, preparing instructional materials, teaching aids and science kits, improving evaluation techniques and teacher training programmes, selecting talented students under the programme National Talent Search Scheme and organizing National Science Fair. Besides, the NCERT is also running a number of projects with the purpose of providing experience which will assist in designing suitable approaches to the universalization of elementary education. Scientific literacy is one component of these projects. Some of the projects for science teaching are being assisted by UNICEF and the UNESCO. The National Science Teaching Project initiated by the NCERT is worthy of mention here. Under this programme, suitable curriculum, textbooks, instructional materials and teacher guides have been prepared for Classes I to VIII. Besides, another programme known as STEP (Science Teacher Education Programme) is being run by the NCERT for equipping in-service science teachers with activity-oriented science teaching. Recently the NCERT has also launched a massive programme under the project 'Reading to Learn' for inculcating reading habits amongst the children. Under the project the component viz., development of scientific attitude has also been taken care of.

The NCERT runs four Regional Colleges of Education which aim, among other things, at achieving an integrated programme of content and pedagogy in seience. These colleges, unlike other training colleges where science teachers get training in pedagogy for a year after doing their content training in a university or college science department, provide a four-year intergrated course of content-cum-methodology to the trainees who have completed the higher secondary stage. Attached to each Regional College is an experimental laboratory in the name of Demonstration School having Classes from the primary to +2 level with a view to testing and practising innovations in the methodology of teaching science and carrying out projects in the field of science education.

At the state level, there are State Institutes of Education, State Insitute of Science Education, and State Council of Educational Research and Training. They have a close liaison with the NCERT and in consultation with state authorities they are responsible for implementing the policies decided at the national level. Besides, they carry out on their own several innovations in the state. Their activities are thus largely concerned with in-service teacher education for the new curriculum and instructional materials. Other agencies working for sciences education programmes are mainly concerned with the preparation of such matrerials, chief among them being the Tata Institute of Fundamental Research at Bombay, Vikram Sarabhai Community Science Centre at Ahmedabad, and Hoshangabad project.

At the scoool level itself, co-curricular programmes are organized by way of having science clubs, quiz contests and wall magazine programmes. State-level competitions for science fairs are also held.

Research in Science Education and its Impact on Teaching

Research in science education is being carried out both at the college and school level. At the the college level, research is confined to a very few areas. Mainly it deals with the improvement of syllabi and their modernization and devising method of instruction by way of preparing teaching aids such as working models, films, slides, film strips and using projection facilities. The COSIP and ULP programmes have significantly contributed in this direction. With the inclusion of a set of experiments prepared by them in the syllabi both at the under-graduate and post-gaaduate level, some teachers demonstrate and adopt the guided discovery method. Others show films and slides. As for physics in particular, one quarterly journal *Physics Education* is published by the National Council for Science Education. Many university and college teachers have contributed to this journal by way of writing articles in simple language.

At the school level, research can be categorized as the work done in four fields : (a) curriculum, (b) methods of teaching, (c) instructional material, and (d) evaluation.

Research in curriculum is done at the M.Ed. and Ph.D. level by individuals and by agencies like the NCERT and the SIES SCERTs in relation to the curriculum framework prepared by the NCERT. At the M.Ed. and Ph.D. level, in the form of dissertations or theses, the studies have been mainly carried out in the direction of the devleopment of syllabi and their scope. A few theses only deal with the recent trends and enrichment programmes pertaining to science curriculum.

The NCERT has been carrying out two innovative projects, namely, Primary Education Curriculum Renewal (PECR) and Comprehensive Access of Primary Education (CAPE) and a number of states are participating in them. The PECR aims at developing innovative curricula suited to the life styles and needs of the children of different socio-economic and geographic variations of India. The projecs CAPE is in the process of evolving flexible, problem-centered, and work-based decentralized curricula and learning materials in the form of pacakages, modules and capsules relevant to the needs and life situations of diverse groups of out-of-school children. General Science is the inbuilt component in both the projects. Non-formal education programmes run by the NCERT and the states as well also include the component of scienee teaching through non-formal means. Besides, the state agencies like the SIEs, SCERTs have also been busy in preparing curricula suited to their conditions for formal system as well. However, there is still much scope for research in science curriculum today.

At the level of Classes I-VIII science education emphasises the idea of 'Science is Doing'. Besides, at this level, according to the nationally approved framework of the ten-year school curriculum, science is to be taught as an environmental study, making it more interdisciplinary in approach and with focal points on the problems in the environment of the child. Also, at the level of Classes IX-XII, the emphasis is on enriching the science content through the activity-oriented approach. Thus, we have to design suitable curricula which reflect the true spirit of the 10+2 scheme. In line with this it will be worthwhile to study new approaches of organizing science curricula and the effects of contemporary science curricula on the development of interest in science. Similarly, a study of how concepts are formed in children of different age-groups will also be worthwhile.

In our schools science at all levels is

taught by different methods by individual teachers. Studies have been carried out to judge their efficacy by way of having control and experimental groups, questionnaire and interview techniques. However, the studies have not kept pace with the scientific advancement and the importance of science teaching, with the result that the syllabus is termed as heavy and only a few conscentious teachers make use of what they are taught during their training in pedagogy. Of course, there have been attempts on the part of the NCERT, the SIES, SCERTS, the Regional Colleges, the Boards of Secondary and Higher Secondry Education of various states to acquaint the in-service teachers with the different methods of teaching science, including programmed instruction, discovery approach, PSI and others by way of organizing seminars, workshops and summer institutes. The most common methods of teaching science in schools at present are (a) Lecture and demonstration method. (b) Experimentation Laboratary/Discovery/Project method, and (c) Combination of different methods. It is, however, desirable that the methods such as inductive, deductive, individualized instruction enquiry approach and programmed instruction be given more importance. Besides, the multimedia, e.g. films, radio, and television can play a key role in arousing scientific awareness amongst the masses.

Instructional materials at various levels have been prepared in the form of charts, models, films, improvised apparatus, laboratory guides, etc., by individuals and several agencies quoted above. Studies have been carried out to test their efficacy. However, there is a need to survey local resources and produce a variety of material so that the instructional materials may be used in diversified conditions existing in different parts of the country.

Evaluation is the area in which the maximum number of studies in science teaching have been done. The areas mainly include achievement tests, diagnostic tests, aptitude, attitude and interest tests, conceptual learning and many others. As a result of this, the tests and examinations conducted by schools for Class VIII and the Boards of Secondary and Higher Secondary Education for Classes X, XI and XII include now the multiple choice type, short answer type and essay type questions. Question banks have also been prepared. At present, there is a need to develop self-criterion referenced tests so that the students may evaluate themselves throughout the year. Besides, the quality of objective type questions framed in public examination also need more attention. Questions based on higher mental processes like reasoning, analysis, synthesis are to be included so that the purpose of evaluation is rightly served.

Training Programmes

We have both pre-service and in-service programmes. In primary education a teacher is trained for all subject areas. For a science teacher there is no special training programme. About 1,200 training schools train teachers for primary classes. The training includes content-cum-methodology courses. For the courses for Classes VI to XII, science teachers are trained by about 300 training colleges. Most of these colleges run regular pre-service courses and a very few of them in-service courses as well leading to the B.Ed. degree. The in-service courses are organized during vacations for those teachers who do not possess any degree in pedagogy but have been in service for a number of years.

The training programme includes mostly teaching of principles of education, child development, and methodology of teaching.

Each of the NCERT's four Regional Colleges of Education situated in four different regions, provide an integrated four-year degree course in content-cum-methodology to the trainees who have completed higher secondry education. Besides, the Regional College of Education at Ajmer has also been running a special course known as M.Ed. Science. During the training, the trainees are exposed to the recent and advanced methods of teaching science. The Regional Colleges of Education at Mysore and Bhubaneshwar have been running yet another new course known M.Sc., Ed. in Physical Sciences and Biological Sciences, respectively. These courses provide training in highly enriched content and in pedagogy as well.

Other than the above regular courses, the NCERT / RCES / SIES / SCERTS and Boards of Secondary and Higher Secondary Education also organize several orientation programmes in the form of workshops, seminars and summer institutes from time to time for equipping in-service teachers with the recent approaches and trends in science teaching.

Science Education—Hopes and Realities

Having taken a stock of the existing pattern and programmes of science education, let us now see as to what extent these programmes have fulfilled the educational as well as national goal, is it for masses or restricted to a privileged class ? Has it brought a significant change in the quality of life ? Unfortunately 40 per cent of 6 lakh primary schools have no building and have a single teacher. Besides, only a few thousands of schools have been supplied the science kit. Thus not more than 38 per cent of our primary schools have those facilities which are wanted for effective science teaching. Allocation of funds has also been not satisfactory. With these limitations, the approach, structure, content and pedagogy of science education have not resulted in desirable scientific awareness amongst the masses. The situation of science education is not better in colleges and universities. With the COSIP and ULP programmes limited to only 211 colleges and universities, their impact throughout the country has not been very significant. Also, little effort has been made to provide a suitable linkage between school and college science education. At the same time, not much attempt has been made to provide interfaces amongst the dfferent disciplines either at the school or college level. Moreover, scienae education has no relevance with the problems of society, with the result that the educated youth is facing the problem of unemployment. Thus, there is a need to make science education more functional. We have to devise relevant but flexible, need-based, and socially useful, curricula as well as methods of teaching science for all students under diversified conditions prevailing in the country. Environment can play a key role in this direction. Conclusively, it may be said that in our country science education is a small plant which has to be nurturned through various means so that it bears fruit in future. □

Work Education in India : Experiences and Plans

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EVEN in the colonial past the educationists felt the need to link with education in India (Wood's Despatch, 1854; Wood and Abbott, 1937) with a view to making education more relevant to life conditions and needs, but such recommendations were hardly translated into practice. Following the Gandhian thoughts on education, establishment of Basic schools throughout the country was a positive step to re-mould a work-oriented education, but inherent complexities of basic education and certain lacunae in its implementation made its acceptance difficult in the context of fast-changing socio-economic conditions of the society. Work experience, as suggested by the Education Commission (1966), was a laudable effort to bridge the gap between work and education, but because of certain factors it could not acquir any pivotal place in school curriculum.

Finally, the Ishwarbhai Patel Committee (1977) gave a much wider, comprehensive, and flexible form to the concept of work experience or work education under the name Socially Useful Productive Work (SUPW) as an integral part of general school education. This curricular area envisages purposive, meaningful, manual work resulting in either goods or services useful to the community, thus providing school children with opporunities to participate in social and economic activities inside and outside the classroom. As per the recommendations, the SUPW programme was suggested for Classes I to X but it was extended over to higher secondary classes (Classes XI and XII) as well

by another National Review Committee (1978).

It is amply evident from the aforesaid that work experience had since long been linked with school education in India in one form or the other, providing the country with varied innovative experiences in the field of education. It is worthwhile reviewing al those experiences under separate constituent aspects of work experience for better comprehension. Here it is pertinent to mention that education in India is a state subject and the states are endowed with powers to adopt/modify nationally accepted educational policies as per their specific conditions, policies, and requirements. This is the reason why we find a great deal of variance in the overall picture of any educational scheme, including work experience, in India.

Nomenclature

Work-oriented education is offered to pupils under different names like work experience, craft education, life-oriented education, socially useful productive work, and so on. Though each of these names signified a particular plan of work experience with varied degree of emphasis on this or that aspect, they were essentially work-based educational plans envisioned to yield certain results in the form of goods/services/personality development, etc. The latest and more comprehensive term for work education in India is Socially Useful Productive Work (SUPW) which covers even certain schemes like "Earn While You Learn", activities under Trysem and Agricultural Science Centres, National Service Scheme, etc. In fact, the scope of SUPW is so vast that any school or extramural activity of the pupils can fall under its purview. This is the reason why more and more states are switching over to SUPW or modifying their work experience programmes in conformity with the concept and philosophy of SUPW.

Objectives

The objectives of SUPW tend to bring about positive behavioural and attitudinal changes in the pupils by inculcating in them desirable values like self-reliance, dignity of labour, tolerance, sympathy, cooperation, helpfulness, etc. Through the SUPW programme the pupils practise and perform manual work individually and collectively and, thus, get themselves acquainted with the world of work and services to the community.

These basic objectives of SUPW find reflection in almost all work-oriented educational programmes launched by the states and other agencies in the country. However, it is not surprising to come across certain novel, creative objectives of work education which tend to give a new dimension to the whole concept of work-based education. For example, the Education Commission expresses its full conviction that work experience in school must lead to increase in national productivity.

A historic document entitled *Curriculum for the Ten-Year School—A Framework* includes ending of class distinction as one of the objectives of Work Experience.

The Central Board of Secondary Education with more than 1,500 affiliated institutions stipulates, *interalia*, (1) skill and productive dimension, and (2) service and emotional integration dimension as major objectives of work-oriented edncation through which production of commodities results by proper combination of head, heart and hands of the school children.

The above account shows the identity of views on major objectives of a few work education programmes in India along with

certain variations. But even such fringe variations do not deviate the programmes from the common path, despite various names given to such programmes.

Structure

Implementation of the work education programme in the country involves a number of agencies for effective coordination, administration, and supervision. Generally, State Institutions of Education or State Councils of Educational Research and Training have SUPW cells which are entrusted with the task of planning and implementing the scheme in the States. However, the administrative control remains with the State Director of Education. The District Educatinn Officers/Assistant Education Officers or Special Officers are directly responsible for supervision and evaluation of the programme in schools. Some states have special evaluation committees to review the programme of work education.

The existing administrative apparatus is generally over-burdened with other routine jobs of the education department, hence it often fails to give the required attention to the work education programme and to steer it up along the envisioned path. Therefore, it was strongly recommended to upgrade and strengthen the SUPW cell at the State Directorate of Education and to constitute SUPW expert committees at the State, district, block, and village levels. Similarly, Boards of Secondary Education are also advised to set up SUPW units. Greater extension role of SCERTs / SIEs is suggested for orienting key persons about the work education programme, teacher training, development of instructional materials, and other related aspects of the programme.

Curriculum

No uniform curricular structure of work education / SUPW is implemented in the states. Some states have syllabi for all the classes with a suggested list of SUPW activities, whereas in some other states, SUPW is confined to some standards only. Some syllabi divide SUPW activities into (1) individual work and (2) group work, while others classify them into six broad areas as per the recommendations of the Review Committee, viz.,

1. Health and hygiene
2. Food
3. Shelter
4. Clothing
5. Culture and recreation
6. Community work and social service

The activities are further spelt out in "doing-learning units" in a suggested format. Activities are drawn from social work and production work going on in the community on the one hand, and school subjects, on the other. They should be in conformity with the objectives of the work education programme.

As curriculum is the total sum of all deliberately planned educational experiences provided by the school to the child, the process of its construction has to be dynamic involving several elements like preparation of curricular plan, development of instructional materials, teacher preparation, evaluation, curriculum renewal, etc.

Accordingly, SUPW curriculum provides for activities in the above-mentioned six major work areas, each curricular area having two components, viz., core activities and work practice. Core activities essentially aim at

bringing about desirable attitudinal changes in the students through their exposition to environment in which they live. Production of goods and services and development of productive skills and competencies are envisioned under the work practice.

Activities for initial classes are of simple, self-expressional type; requiring not much of physical labour from the pupils. The activities become comparatively complex and strenuous in higher classes as they are planned in accordance with the physical and mental development of the pupils. Activities are conducted through the problem-solving approach as they are mostly need-based. The experiences so gained enlighten the students about the "why", "what" and "how" of each operation which are not conducted just mechanically.

Instructional Materials

The routine type of textual materials are irrelevant for SUPW because its curricular area is concerned with learning by doing. This calls for the development of curriculum guides, handbooks, resource units, unit plans, and doing-learning units.

A large number of States and Union Territories have developed a variety of instructional materials as per their needs and requirements. The NCERT has developed a source book in four volumes comprising of different types of activities. Other similar books on work education are also in the process of publication.

Teacher Preparation

It is strongly recommended to involve all teachers in the SUPW programme, besides skilled personnel for different specific activities. As every teacher has to be thoroughly conversant with all aspects of work education, SUPW has been incorporated as one of the subjects in the teacher training programme. Some Basic Training Colleges prepare teachers in a few selected crafts and organize in-service training programmes for general teachers and refresher courses for craft teachers. With the introduction of SUPW, these craft teachers have been assigned this curricular area in many states. However, there is still great need for organizing in-service training programmes on a large scale, in order to provide schools with suitable teachers for an important curricular area like SUPW.

Provision of Necessary Facilities

Core activities can be conducted utilizing whatsoever is available with the school or community, but for work practice definite inputs including certain infrastructural facilities and expertise are essential. Therefore, it is essential that the activities selected for work practice should be need-based. Such facilities are provided by the State Education Department to some extent and schools are permitted to levy special fee for work experience just, may be partially, to meet the requirements of the work experience programme. In some states, the funds allocated to schools for SUPW are considered to be revolving funds, i.e. the money spent on activities is recovered by selling the products.

Supervision and Evaluation

Supervision of the work education programme is mostly entrusted to the SUPW cells working under the State Department of Education or under the State Council of Educational Research and Training. Evaluation of the work-oriented programme rests with the State Boards of Secondary Education for the

lower secondary stage, while for the lower stages it is left to individual schools. Patterns of evaluation vary from state to state. In some states it is internal, while in other states it is a combination of both internal and external evaluation. Internal evaluation requires maintenance of cumulative records showing continuous performance of the pupils. Grades or marks for SUPW are not counted towards the award or certificates, though in some states they are shown in the final examination mark-sheet. In the state of Kerala, the SUPW programme is not evaluated at all.

Evaluation is done for aspects like exposition to work situation, apprenticeship, individual work, group work, etc. The weightage of marks or grades awarded for production-oriented activities is different from that for service-oriented activities. Evaluation is not done through written tests/examinations, but observation and oral tests are commonly resorted to for this purpose.

The work-oriented educational programme in the country has been evaluated by the NCERT and the findings are available through several publications like *Work-Experience in Schools, Third All India Educational Survey, SUPW As It is Practiced in Some Selected Institutions, SUPW in India—A Status Report, etc.*

Non-formal Programmes

Work-oriented education, to varying degrees, is offered in India also through several non-formal programmes which aim at linking formal and non-formal education and have a good work bias. At present, several programmes are underway with the assistance of the Government of India, UNICEF. ICAR, and other agencies. Mostly the rural population of school-going age and older is covered through these programmes. Some of such programmes are : (1) Comprehensive Access to Primary Education (CAPE), (2) Non-formal Education Centres, (3) Training of Rural Youth for Self-Employment (TRYSEM), (4) Krishi Vigyan Kendras (KVK or Agricultural Science Centres). A large number of people are benefitted by these programmes as the programmes do not detract them from their routine work life and offer them education along with good work experience to be made use of in their day-to-day life.

Work-oriented Education — Proposals for the Seventh Five Year Plan

In order to take stock of the situation obtaining in the country in the field of work education, a Working Group on Secondary Education reviewed, *inter alia*, two schemes, viz. Socially Useful Productive Work (SUPW) and Vocationalization of Education. The Working Group made several recommendations which are to be implemented during the Seventh Five Year Plan (1985-90). The recommendations are :

Socially Useful Productive Work

1. The SUPW should not only be a separate subject in itself, but also must form, as far as possible, a part of each subject so as to result in a pervasive influence in the curriculum which would lead to the desired change in the attitudes of the students.
2. Active involvement of the community in the conduct of innumerable SUPW activities must be ensured by the schools as this will result in the approval and sanction of SUPW by the community.
3. In so far as allocation of time for SUPW is concerned, there should be enough flexibility so that SUPW may

be pursued during school hours, beyond school hours, during vacations, and as a part of curricular as well as co-curricular activities.

4. In order to perform the above functions, all activities relating to curriculum development, training, and orientation, the national level unit of SUPW in the NCERT hould be adequately strengthened with experts in major areas of SUPW, and parallel units in the SCERTS / SIEs at the state level should be created for similar functions.

5. Keeping in view the importance of the programme of SUPW, a target-based scheme on the above lines may be prepared and introduced as a central scheme with 100 per cent assistance. It is estimated that the total expenditure on this would be at the level of rupees four crore.

Vocationalization of Education

1. In view of the importance of linking education with productivity, a major impetus has to be given in the Seventh and subsequent Five Year Plans to vocationalization of higher secondary education. The schools have, therefore, to be encouraged to introduce the vocational stream at the +2 stage on a large scale. As far as possible, +2 stage should have vocational courses related to local needs.

2. Facilities of vocational education at the +2 stage should be suitably diversified to cover a large number of fields such as agriculture, industries, trade and commerce, medicine and public health, home management, arts and crafts, secretarial training, entrepreneural training, etc.

3. In designing vocational courses, the schools should keep in mind the regional needs and local employment opportunities.

4. More courses which have a relevance to rural needs, for example those dealing with agriculture and allied sectors, should be introduced.

5. The vocationalized courses shoul~not be terminal in the sense that a student is unable to go for higher education ; but at the same time, vocationaiization should be of adequate level to ensure that the skill obtained will be of meaningful help and use in one's career.

6. The vocationaiization programme should be enlarged further in scope so as to include practical training, and also to ensure that an adequate level of skills is imparted.

7. Suitable instruction material for the programme should be developed, based on vocational and regional manpower surveys.

8. Minimum qualifications for recruitment to government and public sector service should be so modified that, wherever possible, preference is given to those completing the vocationalized stream.

9. On the lines of the All India Board of Vocational Education, Boards of Vocational Education may be set up in each state to suggest programmes of vocationalization and coordination between the various vocational/professional interests such as trade and industry, government departments, public undertakings, and other employing agencies.

10. More central assistance may be given for the introduction of programmes of

vocationalized education for enlarging the coverage of the programmes. Vocationalization may be introduced in 400 schools per year on 100 per cent centrally assisted basis, i.e. 2,000, schools or 4 per cent of the total during the Seventh Five Year Plan.

11. An important component of the proposed centrally sponsored scheme should be the reorganization of the Directorate of School Education and the setting up of special cells in the State Education departments for monitoring the implementation of the programme of vocationalization of education.

The Working Group has also considered in detail the financial implications of the implementation of the above recommendations during the plan period (1985-1990). Expenditure, both recurring and non-recurring; is estimated to be about Rs. 126.00 crore duriag the plan and will c over salaries of the staff, library grant, stores, improvement of school premises, equipment grant, supervisory/administrative training, research, development. etc. □

Need for National Policy on Moral Education

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For many centuries moral and spiritual education has been attracting the attention of one and all in all walks of life. Education is a powerful instrument which helps to bring about effective changes in the behaviour of children. True education is one which promotes harmonious development of all the faculties — physical, mental, emotional, social, moral and spiritual — towards adequate preparation for life.

Aim of Education

Many are of the opin ion that the main function of education is to produce citizens with sound character and healthy personality. Good citizens are the only hope for the progress and prosperity of the country. In this direction, inspiring ideals, proper moral conduct, life based upon good principles are very essential.

It is quite common these days to find leaders in all sectors of society decrying the present climate of moral bankruptcy. Political, religious, social leaders, and even educationists point out that the country is going down hill because the people seem to have lost their moral integrity, sense of values, and that expediency has taken the place of pride as opposed to adherence of principles of conduct. They particularly point out that school students are growing up in a moral and spiritual vacuum.

The National Education Conference (December 1977) and a report entitled *Development of Higher Education in India—A Policy Frame* (February 1978), published by the UGC, have come out with a suggestion that the most urgent and significant reform needed is to transform not only the value system but also the basic structure and processes of the

educational system. It will also imply the shifting of the emphasis from teaching to learning, from individual to social objectives, and from mere acquisition of information to the development of skills and character formation based on knowledge.

Further, the Kothari Commission (1964-66) in its report has recommended the inculcation of "Moral and Spiritual Values" as one of the national objectives of education. Also, the Sri Prakasa Committee was appointed by the Government of India in 1959, to look into the specific provision for the teaching of moral and spiritual values in educational institutions. But precious little has been done to improve instruction in moral education.

Morality is not something to be taken lightly. It is a form of thought and action, parallel to other forms such as science, history, and literature. One should understand that science alone cannot promote a country's progress and prosperity. Equal importance should be given to character formation education also. There is no antithesis between religion and science. This has been clearly defended in the statement of Einstein that "Science without religion is lame and religion without science is blind".

However, it is unfortunate that the present system of education has not taken proper cognizance of this vital aspect. Instead, we are attaching too much of importance to knowledge-oriented education and schools are interested just to prepare students to take public examinations. Most of the presentday schools and colleges have become shops of profit and loss without giving sufficient weightage to moral education. Our graduates run after money, power, comforts, honour, and titles. The mind of the youth is much contaminated by undesirable influences and our moral fibre is becoming thinner and thinner day by day.

True education, therefore, must teach not merely some means of earning livelihood, but it must develop moral and spiritual qualities of the students. The programme of moral education should help school-going children to understand the significance of morality. Morality is the conformity to the moral code of the social group. It is the internalization of a set of virtues,ideas and values sanctioned by society which becomes an integral part of the individual self through the process of development.

The programme of moral education should help school-going children to practise the following types of values : honesty, truthfulness, justice, fairness, loyalty, patriotism, charity, generosity, adventure, courage, critical thinking, friendliness, integrity, individuality, open-mindedness, hospitality, dignity, punctuality, tolerence, patience, rationality, respect for rules, respect for the views of others, perseverance, sincerity, thrift, modesty, gratitude, cleanliness, courtesy, politeness, cooperation, loyalty, responsibility, self-reliance, self-discipline, self-improvement, diligence, self-confidence, orderliness, beauty, love for family and school, freedom, kindness, concern for others, etc. These concepts should be explained by drawing a number of examples from day-to-day life situations. Opportunities should be provided for students to think independently and to discuss controversial matters involving moral themes. This will help the children to become better citizens, because "tomorrow's citizens are moulded in today's classrooms".

The ultimate aim of moral education is to help every individual to become a useful and productive member of the society, keeping in mind one's own moral development and, at the same time, national development.

Beginning of Moral Influence

Moral influence begins in the family, before

the children come to school. In the school, the children are subjected to its systematic influence. The influence may not be as strong as that of the family, but its educative and socializing effects are important.

At present, due to the complexity of modern society, the home is gradually losing its importance. The school has taken over a number of functions from the home. Thus, the school has to shoulder greater responsibility of moulding the children's character on sound scientific lines. The school should give all importance to secular morality because our country has chosen the twin principles of democracy and secularism.

For many children, the school is the only source of regular moral influence they are exposed to, apart from that of their home and their peer group. We should recognize that the home is, on many moral issues, severely limited in its approach. Very many homes can offer little of direct help in promoting moral growth among the children.

The secondary school stage has been compared to a period of stress and strain and storm and strife. At this stage, school students learn social values by imitation, by a proces of osmosis. They learn things by force of examples. But there are not many good examples in many walks of society outside of school. At present, unfortunately there is a degree of growing admiration for those who violate law, principles, and make money. A black-marketeer or an actor who has amassed millions by throwing to the wind the last shreds of conscience and morality, becomes almost a hero.

It is a fact that the school has been deliberately organized for educational ends. Therefore, it should be based on publicly accepted principles. The school must first act as an extension of the family, it should supplement the home facilities. Further, it has to perform many specific functions. There should be proper patterns of behaviour (in the relations between children, between children and adults, between the head of the school and the staff).

Bullying, cheating, creating fear, adopting irrational practices, decisions based on personal will, pointless maintenance of tradition, irrelevant use of status, all these are not acceptable in any institution and certainly not in one which is committed directly to moral instruction. A mismanaged school is not only an immoral place in itself but develops in the children beliefs and dispositions that are highly non-educative.

Moral education cannot be carried out simply by imposing even the best rules and regulations through punishment and reward. Nor is it achieved simply by the children being told what to do, nor again by their having teachers as suitable models for behaviours. All care should be taken to see that at the one end of the schoo! must provide firm external control and at the same time it should give autonomy to the children so that they can reasonably and effectively enter into discussions and take decisions that actually matter. External authority must, therefore, be indirect and flexible. Further, every school should have a firm authority structure whose rules, principles and forms of punishment should be clear and defensible. The children should be encouraged to have proper role-taking means for their moral development.

Role of Teachers

The teacher occupies a pivotal role in imparting moral instruction to the students. However, unfortunately, most of our teachers are the product of a spiritually barren education. Their mental attitude is just oriented towards the subject and examination. The teachers should behave like true moral agents to help school authorities and parents to

change their attitude towards moral education. If the teacher meets only in the class where some particular area of academic matter is the central point for discussion, his understanding of the children will be quite inadequate for a relationship in which complex moral interests of the children are seriously handled. A tutorial house or counselling system is a must, because it helps the teachers to understand the children properly.

The curriculum should provide enough opportunity for the pupils to acquire a considerable amount of knowledge that is essential for morally responsible living in our democratic society. An understanding of the attitudes, emotions, feelings, values, and motives of the pupils is equally important. Therefore, new activities for personal understanding need to be built into school work.

In moral education, as in any other area of education, what is asked of the teacher is a total commitment to the development of rational autonomy in both thought and action. Further, suitable books should be prepared for all stages of education from primary to university, The NCERT, the SCERTs and other agecies should come forward to prepare quality textbooks in the field of moral education.

The existing school curriculum should be restructured in the light of social changes that are going on, so that school-goers may understand their significant role and contribute to the development of the nation.

Science alone cannot make a country great. What is more important is the other side of the coin, i.e., Moral Education. Right from the grassroot level, the children should be exposed to the concept of moral education. The parents, the Government, and the press have to cooperate in this venture.

No doubt in many States of India, a separate period is designed for teaching moral education in schools but unfortunately these periods are seldom used for the set purpose ; instead, these periods are being used for completing portions from other subject areas. Therefore, schools have to take proper care to impart moral education to the children. In fact, it is high time that the government come forward with a national policy on Moral Education. □

Noble Calling but Poor Returns

SHAMSUDDIN

THE average male teacher in India is between 25 and 35 years of age and is married, with three children. He has a low socio-economic background and is a member of a joint family. He is not trained for his job, though he subsequently goes through a teacher training course. This shows that his choice of a career is determined by the fact that he can secure a job in a profession that is not over-crowded.

The woman teacher, on the other hand, comes from a better-class family. She is under 25, and is usually single. This may be due to limited chances of marriage, and hence the need for economic independence.

This is the picture that emerges from a questionnaire sent out to 250 teachers in Delhi (136 men and 64 women) in schools ranging from government institutions to mission schools.

It is a matter of satisfaction that after the achievement of Independence, rapid expansion has been taking place in the field of education. Several schools are being opened every year and pupils from all sections of society are flocking there in large numbers. All this speaks well for the democratic traditions which we are trying to build up in our country, the success of which depends on an enlightened mass of citizens.

A Strange Paradox

Despite this expansion, a strange paradox is evident. The condition of the teacher, called the builder of the nation, who is said to influence largely the future of the child, is miserable. The socio-economic conditions of the teachers are not likely to contribute much to their well-being. This unhappy

situation, thus, effects the enthusiasm and efficiency with which the teachers tackle their jobs. An attempt is made here to study the socio-economic background of the teachers on their work, and to suggest ways and means of improving their conditions of service.

The following material was compiled by sending out a questionnaire to teachers, visiting schools, and conducting interviews with principals, administrators, educationists, and people interested in improving the financial condition of the teachers. The investigation was limited to the secondary school teachers in the area covered. The questionnaire was sent to 250 teachers selected through a random sampling method. About 80 per cent of the teachers answered the questionnaire.

The data analysed here relate to 200 teachers (136 men and 64 women teachers). The schools were selected on a representative basis and included government, semi-government, private, and mission schools for boys and girls. The data collected from the teachers covered their marital status, number of children, age, parents' occupation and education, family background, etc.

The marital status has a bearing on a person's work, since marriage age increases the financial burden on the head of the house and adds to his responsibilities. In India where early marriages are still prevalent in rural and conservative families, a person is forced to take up a career while he is studying, to make both ends meet. He then resorts to the most readily available career which is teaching.

The statistics relating to the marital status or otherwise of the teachers questioned are given in Table 1.

There is a marked difference between men and women teachers in regard to marriage. Only 15.44 per cent of the men teachers are single and as many as 83.09 per cent of them are married. The case is different with the women teachers. About 59.38 per cent are single and only 26.56 per cent of them are married. The fact that they got married early evidently influenced the men teachers into taking up teaching as a profession because of the increased burden in supporting the family. As far as the women teachers are concerned, absence of marriage prospects in most cases influenced their choice of the career.

Surprisingly, not even one teacher gave any information on whether they were separated or divorced, if married. Only 1.47 per cent of the men teachers did not give information as to whether they were married or single, but 14.06 per cent of the women teachers gave no answer to this query. They refrained from doing so perhaps thinking that the matter was confidential.

Respose to the questions about the number of children showed that the men teachers

TABLE 1

Marital Status of the Techers

S. No.	*Marital status*	*Percentage of men teachers*	*Percentage of women teachers*
1.	Single	15.44	59.38
2.	Married	83.09	26.56
3.	Widowed	—	—
4.	Separated or divorced	—	—
5.	No response	—	—
	Total	100.00	100.00

have children between 1 and 7; and the women teachers, between one and five. The average number of children of three in the case of the men, and two in the case of the women teacher. This is a good sign as there is evidence of family planning in the teacher community. But the teacher-parents were rather dubious about their own children's educational future. One teacher said, "You hardly ever hear of a teacher's son going abroad for higher studies. His father just can't afford it".

A teacher will naturally want a higher education for his children, and seeing no hope of making a good income may switch over to some other lucrative job.

Information about the age of the teachers collected to determine its influence on their choice of career is given in Table 2 below.

The Table indicates that a large proportion of young people have taken up the teaching profession. Among the women teachers, almost half are below 25 years of age, roughly 30 per cent between 25 to 35 years, and only a small percentage above 35 years. Their average age is 26.5 years. This may indicate lack of experience on the part of most of the women teachers, but youth has its advantages. It also indicates an increasing interest in the teaching career. This should go a long way in their contribution to the profession.

The majority of the men teachers (roughly 70 per cent) are in the age group 25-35; a small percentage above 35 years. Only 17 per cent are below 26 years, the average age of the men teachers being 28.8 years. It represents a young, yet mentally mature class of men teachers giving the benefit of their energy and enthusiasm to the teaching profession.

It was observed that some of the men entered the profession early and continued their education while working, since they could also take up the profession early in life as they did not need any professional preparation before joining the career. In this country, a man or a woman usually takes up a job and later prepares professionally for the teaching career.

In another questionnaire covering the parents' education, the teachers mentioned the qualifications of their fathers and omitted information regarding their mothers, as their mothers were, by and large, illiterate.

TABLE 2

Age of the Teachers

S. No.	*Age-group (years)*	*No. of teachers*		*Percentage*	
		Men	*Women*	*Men*	*Women*
1.	Below 25	23	31	16.91	48.43
2.	25-30	59	9	43.38	14.06
3.	30-35	36	10	26.27	15.63
4.	35-40	10	3	7.35	4.69
5.	Above 40	5	3	3.68	4.69
6.	No response	3	8	12.50	—
	Total	136	64	100.00	100.00

TABLE 3

Father's Education

S. No.	*Education*	*Percentage of men teachers*		*Percentage of women teachers*	
1.	Illiterate	2.21		—	
2.	Primary Pass	20.16		3.12	
3.	Middle Pass	16.18	53.98	3.12	39.05
4.	Matric	17.64		32.81	
5.	Graduatc	7.35		18.76	
6.	Post-graduate and qualified professionally	4.41	17.34	9.38	28.14
7.	Other examinations passed	5.58		—	
8.	No response	26.48		32.81	
	Total	100.00		100.00	

It is evident that the greater percentage of men teachers come from families where their fathers are educated up to only the high school stage. A very small percentage comes from families where the fathers have had higher education. Many teachers did not give any response to this query. The women teachers come from better-educated families. Generally speaking, the teachers seem to be, by and large, drawn from the less educated families. Highly educated parents probably prefer some other careers for their children. It is for this reason that many teachers lack social status. Their outlook, behaviour and, standard of life are affected by it. Thus, the educational background of the teachers' family is an important factor determining their career in life.

In another questionnaire, information about the occupation of the teacher' parents was sought. Here, too, the respondents recorded information about their fathers but omitted information about their mothers. Only ten teachers (including men and women) said that the occupation of their mother was teaching, two said that they were nurses, and the rest either gave no information or mentioned "household work" as the main occupation of their mothers. The information spplied by the teachers is given in Table 4 below.

TABLE 4

Teachers' Father's Occupation

S. No.	*Occupation*	*Percentage of men teachers*	*Percentage of women teachers*
1.	Service excluding teaching	24.27	48.43
2.	Business	8.82	7.81
3.	Teacher	7.35	9.38
4.	Cultivator	39.71	4.09
5.	Pleader	2.20	7.81
6.	Doctor	1.47	3.12
7.	No response	16.18	19.36
	Total	100.00	100.00

The Table 4 indicates that the fathers of teachers are generally in service, or are cultivators. Only a small percentage of both men and women leachers indicate business, legal, and medical practice as their fathers' occupation, Only 7.35 per cent of the women teachers indicated teaching as their fathers' occupation. A majority among the men teachers speak of cultivation as their fathers' occupation. There was no response from 16.18 per cent men and 19.30 per cent women teachers. Evidently, they did not like to mention the occupation of their fathers.

From this Table it appears that the teachers come from a comparatively poor class. They are naturally more absorbed in the bread-and-butter problems than in higher intellectual pursuits. In the noble and honourable work of teaching, as already indicated in the personal interest questionnaire, they fail to put out their best in the profession due to their economic difficulties.

This is supported by other information regarding the family. The teachers were asked, "Do you live in a joint family ?" Out of 200 teachers, 120 (60 per cent) mentioned that they do live in a joint family. The average number of members in their families is 10. This is in keeping with the Indian tradition. Despite the western influence for over two hundred years, the structure of our social life has not changed much.

The teachers usually prefer the joint family system. Of course, this involves a greater financial burden and more sacrifice on their part to keep the family going.

The socio-conomic background of the teachers reveals that the majority of the men teachers belong to the lower middle or middle-class families. The majority of the women teachers, however, come form upper middle and some form the high-class famillies.

The Need

The economic status of the teacher needs to be improved. Though their pay-scales have been revised, the concessions made are largly nullified by an increase in the cost of living. Their pay-scales should be set at par with those in othet learned professions. Economic help in the form of allowances for extra work, loans for constructing houses, and other remuneratory benefits should be given to the teachers.

The difference in the salary-scales of upper division teachers and lecturers in higher secondry schools should be abolished to avoid envy and friction between them. All should be given equal pay with exter allowances for aditional duties.

Besides a higher scale and other allowances, the teachers should be granted free medical aid for themselves and their families, free education of their children upto matriculation, travelling concessions on study tours, and permission to stay at low-cost holiday homes during the vacation.

The conditions of work in schools should be improved. Authoritative control should be replaced by a democratic system where the teachers will have greater participation in the day-to-day working of the school.

Semi-government and private schools should be treated at par with government school in all respect. Facilties of pension, general provident fund, and gratuity, etc. available to government schools teachers, should also be extended to the teachers in other schools. □

Process of Science Instruction : A Model

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Science as a body of knowledge is characterized by the organized structure of knowledge that forms its core, and the process by which this knowledge is generated. Science has within its purview numerous bits of information concerning diverse phenomena. These bits of information are arranged in a classificatory system governed by a set of generalizations which, in turn, are subsumed by certain laws, principles, and theories, ultimately terminating in a limited number of major conceptual schemes. Thus, the organizational structure of science can be viewed as pyramidal. The core knowledge of science forms an internally consistent structure. Also, since science purports to understand and explain natural phenomena, its core knowledge has necessarily to be consistent with whatever information is available about the natural phenomena. A new information is accepted only if it does not disturb this consistency. If it does, than it is either rejected as invalid or it creates a dissonance within the structure which may lead to a structural reorganization[1]. As the core knowledge interacts with an unexplored aspect of a natural phenomenon, a certain pattern of events gets anticipated. This pattern, by necessity, will be in consonance to the structure of the core knowledge, and may be called a theoretical proposition. Such a proposition, on analysis, would suggest the occurrence of certain specific, observable hypothetical events. It is validated by searching for the hypothesized events by fabricating the conditions where they would occur. The actual occurrence of these events would strengthen the proposition and their absence would suggest its modification. This constitutes the empirical verification of the proposition. A continuous cyclic

occurrence of formulation of theoretical propositions and their empirical verification would describe the process by which scientific knowledge is generated.

Cognitive Structure

Considering the structure of science as discussed above, a cognitivist's position on learning seems most appropriate for explaining learning of science. Learning science, therefore, is construction of cognitive structures in the learner isomorphous to the conceptual structure of science[2]. Hence, learning of science is not merely storing isolated bits of information concerning natural phenomena in memory, but progressively constructing a wholistic, unified, and internally consistent understanding of the phenomena[3]. This is not possible when the learning mind is just a passive receiver of information. Here, it freely articulates the structure that it already has and actively interacts with the phenomena. A logical corollary to the above contention it that just as the conceptual structure (core knowledge) of science gets constructed through the process described before, the construction of cognitive structure (learning) of an individual is through a more or less an analogous process. To state more explicitly, the learning of a concept is actually discovering the concept from the learner's point of view, and not memorising the verbal statement of the concept.

Any formal curriculum of science aims at imparting only those aspects of scientific knowledge which are accepted into the stable and relatively permanent core of science. That means, having to teach science would apparently imply only looking at, in retrospect, those aspects of scientific knowledge which have already undergone the test of empiricism and which have been discovered 'beyond doubt' and presenting them suitably in a learning situation. This might suggest that a mere didactic presentation of information contained in science would best help instruction. However, such an approach does not take into consideration the importance of the learner activety interacting with the learning environment. A pure didaction reduces the status of a learner to that of a passive receiver. Conversely, an effective instructional situation in science is that which presents a set of conditions that act supportive to the learner's free articulation of his existing cognitive structure and an active interaction with his environment, thereby constructing a newer and stabler cognitive structure. aIf unit of learning is considered as a structure, what instrucation provides is not a complete structure *per se* but its incomplete skeletal frame, in consideration to the cognitive readiness of the learner, for him to interact and to fill in the details to complete the structure. In an open inquiry-instructional situation what is given is only a minimal direction so much so that there remains numerous diverse possibilities of completing the structure. Since, however, the instruction pertains to already discovered knowledge, there probably is no need to repeat certain conceptual errors and deviations that scientists have committed time and again in history. Historically, a concept might have evolved in a detour fashion after having entertained many alternative explanations to the phenomena concerned and taking time to eliminate the incorrect explanations pending theoretical and methodological breakthroughs. Since learning is what may be called a rediscovery of the concepts which already form an integral part of the conceptual structure of science, most of those detours could be bypassed to ensure the economy of instructional efforts That is, the optimum infrastructural informations are presented, and presented in such a way that it serves as a problem for the

learner fo work on and solve. The optimum nature of the information is decided in such a way that it is not too little for the possibilities of deviations from the anticipated direction, or to be too diverse to be handled in a formal instructional situation. At the same time, the quantum of information should not be too great that it curbs the initiative of the learner and his active participation in the instructional interactions.

Scientific Inquiry

The primary function of formal instruction in science, in the present socio-historical context, seems to be two-fold. The preparation of one, consumers of science, and two, the practitioners of science. On analysis, this suggests that the aims of science instruction are to impart scientific knowledge, to equip the mind with certain abilities that govern the process of science, and to develop a general mental disposition that may be called scientific attitude. These three aims of science instruction do not call for isolated consideration and mutually exclusive instructional treatments for their attainment. On the contrary, every bit of instructional input will have these aims as its dimensions. Taking a cue from the model of science learning as described earlier, the instruction of scientific knowledge will have to be organized in consideration to the structure of the core knowledge of science[4], the process through which it has been generated, and also the attitude which serves as a precondition for this. Imparting of scientific knowledge would ultimately mean the internalization of the basic conceptual schemes of science by the learner. This means that the specific bits of information are just the medium through which these conceptual schemes are built.

This necessitates the use of the process of scientific inquiry as a strategy of building the basic conceptual schemes of science. Such a strategy of learning is possible only if certain emotional and attitudinal conditions are contiguous to the learner's free articulation of thought and exploration.

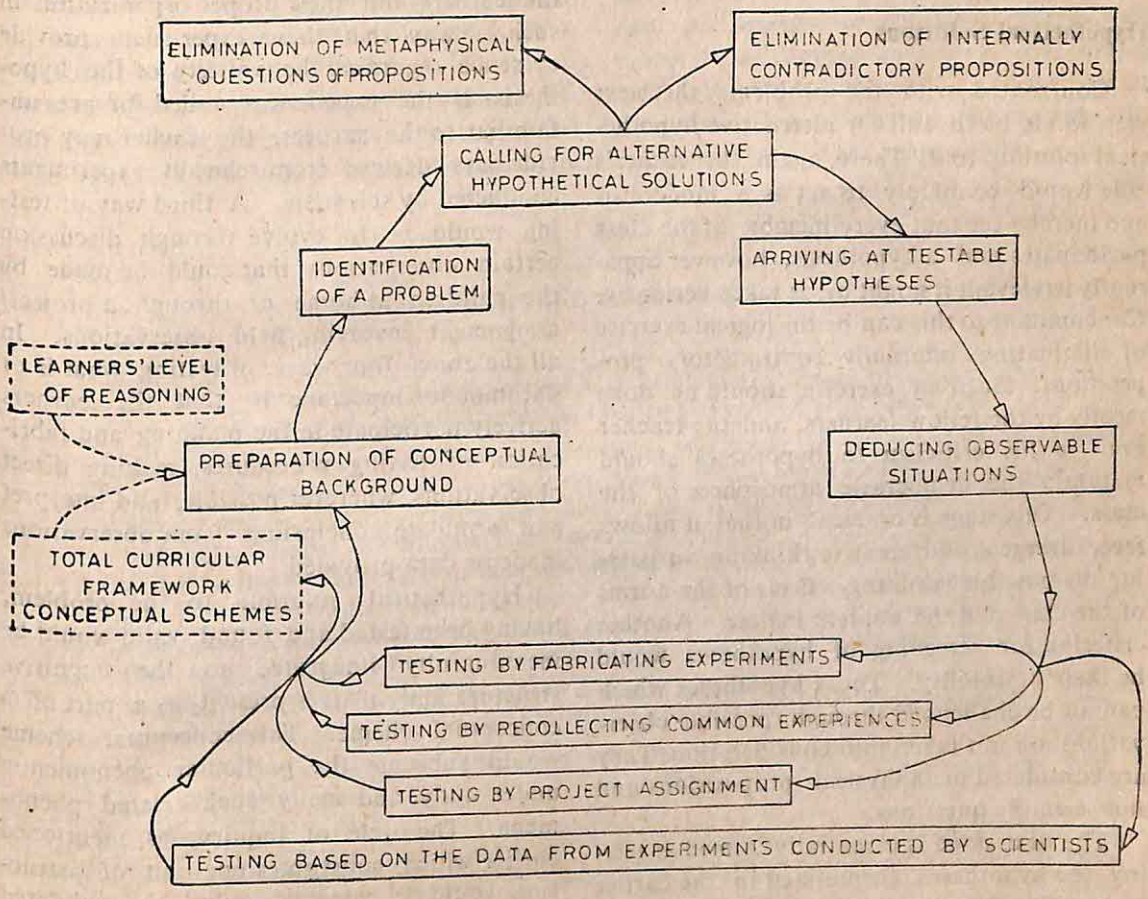
The substance of a curricular frame is these conceptual schemes which form its basic theme. A curricular frame in its most condensed form is a flow chart of these interrelated conceptual schemes, taking into consideration their relative abstraction. This, when analysed, would provide a complex network of specific concepts, facts, principles theories, etc. This network, when seen against the hierarchy of cognitive stages of the learners and the cognitive abilities that characterize these stages, would suggest a further break-up in terms of a hierarchy of multiple cross-sectional flow charts[5]. These multiple cross-sections could refer to the content pertaining to different grades.

Classroom Interaction

In this context of a curricular frame of science, the next question would be regarding the nature of the classroom interaction. It has been already substantiated in earlier discussions that learning of science is a process of re-discovery of concepts by the active interaction on the part of the learner with his environment. Since learning is the central concern of instruction, the classroom interaction should create an environment that acts supportive to the active interaction on the part of the learner. However, as discussed earlier, due to considerations of efficiency and economy, especially in the context of formal education, the classroom interaction cannot be an uncontrolled free inquiry but would be what may be called a guided inquiry where the teacher acts as a facilitator and guide to the process of inquiry.

The cognitive processes that underlie the

A DIAGRAMMATIC REPRESENTATION OF THE MODEL OF SCIENCE INSTRUCTION



classroom interaction in science should be taken as cyclic in nature. A diagrammatic representation of this has been provided in the figure. The first step in this cycle constitutes the teacher preparing a conceptual background through discussion or through the provision of a concrete experience which culminates in the identification of a problem. Here, the problem is not arbitrarily thrust upon the students, rather, in the given background, it gets evolved as a hurdle in the way of their understanding and explaining a certain phenomenon. It may be mentioned here that this problem situation is not accidentally stumbled upon. The teacher consciously creates the background of the problem, keeping in view the total curriculum framework and the conceptual scheme to be highlighted and also the level of abstraction which the stage of cognitive development of the learner allows. In the problem-posing phase, one thing that the teacher could take care of is that the problem is meaningfully perceived by every section of the class, especially in the light of the possible heterogenity of a normal class of learners. Needless to say, this task is quite challenging and calls for insights that the teacher must have gained

into the characteristics of the group of learners and also the structure of the content.

Hypothetical Solutions

Confronted with the problem, the next step would be to call for alternative hypothetical solutions to it. There, again, the teacher's role would be mainly to act as a moderator and thereby see that every member of the class participates and a hypothesis, however apparently irrelevant it might be, is taken seriously. Concomitant to this can be the logical exercise of eliminating internally contradictory propositions. Such an exercise should be done mostly by the fellow learners, and the teacher even in his criticism to hypotheses should maintain the democratic atmosphere of the class. This stage is crucical, in that it allows free, divergent and creative thinking surpassing the possible inhibitory effects of the norms of the class and the content matter. Another criterion for screening of hypotheses would be their testability. Those hypotheses which cannot be challenged through possible observations are not taken into consideration. They are considered metaphysical propositions and not scientific questions.

The next stage is essentially aimed at testing the hypotheses formulated in the earlier stage. The first step in the testing procedure is to deduce the hypothesis into possible observational events through which it can be tested for its validity. However, for the testing *per se*, a formal instructional situation has a lot of constraints regarding physical resources and time. Ideally, what is desired and could be done, wherever possible, is to fabricate procedures through which observations can be made regarding the validity of the hypotheses. Many a time, this may not be possible due to the nature of the concept, facilities required for making the necessary observations, the time it might take, etc. In such situations, there could be three other ways of putting the hypothesis to test. One is the recollection of common experiences of the learners and their proper organization in such a way that these experiences provide evidence regarding the validity of the hypothesis. If the experiences called for are unfamiliar to the learners, the teacher may provide data derived from relevant experiments conducted by scientists. A third way of testing would be to evolve through discussion certain observations that could be made by the children at home or through a project/assignment involving field observations. In all the above four ways of testing what is of paramount importane is that the learners actively participate in the planning and fabrication of testing procedures, making direct observations, wherever possible, and interpret and formulate conclusions from observations made or data provided.

Hypothetical solutions to the problem, having been tested and found valid would be meaningfully integrated to the cognitive structure only if it is present as a part of a conceptual scheme. This conceptual scheme would subsume the particular phenomenon under study and many such related phenomena. The cycle of inquiry, as mentioned earlier which constitutes one unit of instruction would be complete only if the validated hypothesis is linked with a major scheme of relationships. Here, there are two alternative ways of establishing this linkage. One, by presenting a major principle or cenceptual scheme as an advance organizer which subsumes the bits of information learnt subsequently in a deductive manner[6]. Two, presenting a series of inquiry—instructional situations to inductively arrive at a generalization or a broad scheme of events. The teacher's role here as a coordinating agent is very vital. He may have to synthesize several such validated hypotheses into a meaningfully related structure and, if necessary, present it in a historical perspective.

The model presented here does not restrict itself to any particular stage of education. Rather, it is meant as a general framework. A clarification that could be made here is that it may have to be viewed differently, in a qualitative sense, depending upon the level of abstraction that the learners are capable of. In other words, the problems, hypotheses and the way they are tested would qualitatively differ depending upon the level of reasoning of the learners. However, this paper does not discuss details of the conditions under which this model can be put to practice. Details such as teacher preparation, instructional material and other accessory components, specific instructional inputs, infrastructural conditions, total instructional system, etc., can be discussed only contextually. □

NOTES AND REFERENCES

1. This is what Thomas Kuhn calls as normal and revolutionary phases of science. See Kohn, T. S., *The Structure of Scientific Revolutions*, Chicago University Press, Chicago, 1962
2. This idea of the isomorphism between the cognitive structure in the learner and the conceptual structure of science, as well as the idea of the hierarchical nature of concepts is in accordance with the theories of David Ausebel. See Ausubel, D. P., *Educational Psychology : A Cognitive View*, Holt, Rinehart and Winston, New York, 1968
3. As Jerome Bruner states, "To instruct someone (in these disciplines) is not a matter of getting him to commit results to mind. Rather it is to teach him to participate in the process that makes possible the establishment of knowledge.....Knowing is a process, not a product". (Burner, J. S. *Towards a Theory of Instruction*, W. W. Norton, New York, 1966, pp. 72
4. The mastery of the structure of the subject matter as a condition for learning is highlighted by Bruner. (Bruner, J. S., *The Process of Education*, Harward University Press, Cambridge, 1962)
5. The hierarchy of cognitive stages mentioned here has reference to Jead Piaget's stages of cognitive development. See Modgil, S. and Modgil, C., *Piagetian Research. Compilation and Commentary*, NFER, Windsor, 1976
6. This has reference to David Ausebel's concept of Advanced Organisers for meaningful reception learning. See Weil, M. and Joyce, B., *Information Processing Models af Teaching*, Prentiee Hall, Englewood Clifiss, New Jersey, 1978

Retention of Subject Matter in Physics : Individualized System of Instruction and Lecture Model

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MOST of the public examinations lay stress on the mastery of factual information of the prescribed subject content. The over-emphasis on factual learning could be attributed to the following facts :

1. There is a strong belief that learning is the recall of facts.
2. It is easier to construct and score the tests measuring the mastery of factual information.

A lot of work has been done in investigating students' retention of factual knowledge. Studies reported by Skinner (1949) indicate that 25 per cent of the subject matter of history was still retained by the students six months later. Also, students retained one-third of algebra taught to them a year ago.

Skinner further reports the study of the retention of three instructional objectives as related to retention : (*a*) the ability to recall factual information, (*b*) the ability to explain scientific phenomenon, and (*c*) the ability to draw conclusions from the given data. He found that the higher abilities, i.e., (*b*) and (*c*) persist over longer periods of time with only a slight loss in retention.

In the light of the earlier studies, the present researcher undertook a study to investigate immediate and delayed retention of sub-

* The author is thankful to Dr R. N. Mathur of the NCERT for the permission to use his ISI material and Mr Y.P. Bhardwaj, Principal and Director, Moti Lal Nehru School of Sports, Rai for the permisslon to conduct the study in his school.

ject matter in physics in two learning situations, namely, Individualized System of Instruction and Lecture Model.

The Problem

A comparative study of the effect of Individualized System of Instruction (ISI) and the Lecture Model (LM) on the retention of the subject matter in physics for the students of the age-group 15-16 years.

About ISI

The ISI is an instructional strategy in which students learn a study unit at the mastery level at their own individual paces, with their difficulties attended to individually by a tutor or an instructor. The ISI, unlike IM, is characterized by :

1. Review test-items to assess the consolidation of the study unit.
2. Active interaction between the student and the learning material, and the student and the instructor.
3. Reading with thinking at one's own pace.

Hypotheses

The hypotheses stated in the null form are as follows :

1. The ISI has no better effect on immediate and delayed factual recall than LM.
2. The ISI has no better effect on the retention of subject matter than LM for higher abilities of learning, i.e., comprehension and application.
3. There is no signifieant difference in the loss of retention of subject matter in the cases of LM and ISI.

Sample

The two matched groups of fifteen students, each of the age 15, studying in Class XI in the Moti Lal Nehru School of Sports, Rai (Haryana) worked as a control as well as experimental group.

Design of the Study

The control group was taught the topic of 'Work, Power and Energy' through LM, while the experimental group was taught the same topic through ISI. The study material for the experimental group was provided by the National Council of Educational Research and Training (NCERT).

The initial acquisition of retention was measured immediately after teaching the topic and then after two months. In this period of two months there was no formal review of the topic.

A test in duplicate form was used for the measurement of the retention of the factual information initially and after the lapse of two months. The recall test cosisted of 40 test-items, with 10 test-items for each of the abilities, i.e., cheap recall, recognition recall, comprehension recall, and application recall.

Analysis

The test was followed by a measurement on the basis of the mean score of the two groups in each of the abilities. On the basis of the scores of the two groups in the tests, the percentage difference and the co-efficient of correction for the retention loss for the two groups was calculated. The mean scores of the initial and final recall tests of the two groups are summarized in the following Tables.

TABLE 1

Mean of Retention of the Subject Matter in the two Groups : ISI Group (Experimental Group A) and LM Group (Control Group B)

Recall Test	*Group A*			*Group B*		
	Mean initial score	*Mean final score*	*Mean loss in two months*	*Mean initial score*	*Mean final score*	*Mean loss in two months*
1. Cheap	73	53	20	60	35	25
2. Recognition	86	76	10	72	55	17
3. Comprehension	85	75	10	82	68	14
4. Application	90	81	09	91	78	13
5. Mean	83.4	71.1	12.3	76.2	59	17.2

TABLE 2

Comparison of the Two Groups A and B for over-all Loss in Retention of the Subject Matter

Mean Retention Loss		*Co-efficient of Correlation*	*Level of Significance*
Group A	*Group* B		
12.3	17.2	.25	.01

Findings

The results from the test score data are summarized as follows :

1. There is relatively less retention loss in the subject matter related to higher abilities in both IM and ISI.
2. Initial and final retention of the subject matter is more in ISI as compared to that in LM.
3. The relative mean retention loss in the case of ISI is 5 per cent less than that in LM.
4. There is about 7 per cent increment in the initial retention of the subject matter when taught through ISI.
5. The delayed retention of the experimental group showed about 12 per cent increment.
6. The ISI results in better retention of the subject mater as compared to LM.
7. The retention of the subject matter is significantly higher at .01 level in the case of the ISI than the LM group.

It becomes amply evident from the findings that ISI produces better retention of the subject matter as the students learn at the mastery level by consolidating the matter. They read the study units with understanding and get their difficulties solved individually. It seems that all these features of ISI help in better retention. Thus, the stated null hypotheses are disapproved on the basis of the findings of the study. Also, it stands proved that retention can be improved by learning and self-review of the material during the tenure of learning.

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Individually Guided System of Instruction in Mathematics

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IT IS now being increasingly felt that there is inequality in educational achievements and educational opportunities which go against the principle of democratization of education. Much of this is due to the present-day system of education. Not only our parents and grandparents but we and our children are also taught mathematics using the traditional method, i.e., the lecture method. The traditional system is defective in as much as it does not take into account the wide differences in abilities of individual students. The needs and potentialities of individual students are often neglected. The differences are not only quantitative but also qualitative. The achievement of students tought by the traditional methods often results in a normal (ball-shaped) curve where A grade is given only to ten per cent of the students and an equal proportion of students are given F grade. The very large number of students receiving C grade or below cannot be considered to have gone through successful learning experience. The normal curve is a result of random processes but since education is a purposeful activity where we expect the students to have learnt what is taught the learning outcome must be better than normally distributed.

The IGSI

In the last 30 years researchers have experimented with many different methods of instruction. Several of them have resulted in higher achievement when compared with the traditional method of instruction. Some of these new methods require highly sophisticated

equipments such as tape recorders, video cassettes, television, etc., which are very expensive. However, there are some methods which do not require such expensive equipment but instead use senior/faster students to tutor other students. Considering the country's economic condition, an innovative Individually Guided System of Instruction (IGSI) (Mathur 1983) has been tried out in mathematics in actual classroom situation. In this system all students achieve the same mastery (high achievement) level by repeated testing and frequent positive reinforcements. The purpose of this paper is to report the findings of this try-out.

Main Features

The main features of IGSI in mathematics are :

1. Individualized instruction
2. Mastery learning
3. Guided self-study
4. Student-tutored
5. Self-paced
6. Regular reading habit
7. Mathematical reasoning
8. Automatic revision
9. Instant reward

These features are discussed below :

Individualized Instruction

It is well known that during the learning process needs of different students are different. Because of their different learning needs pupils require help on an individual basis. The present system caters to the needs of a group, ignoring individual needs. The IGSI is completely individualised to meet the different learning needs and the rate of growth of each individual.

Mastery Learning

On the basis of recent researches on mastery (high achievement) learning it is claimed (Bloom 1968) that about 95 per cent students can attain a high level of mastery. Some students may take shorter time while others longer, provided the right kind of help and materials are available to them.

All the students in traditional classrooms follow a rigid time-table. The slow learners do not get sufficient, time while the fast learners get bored. In the IGSI the variables of mastery learning (Mathur 1980) are optimised. The IGSI system provides enough time for learning to each individual. The material is provided through study guides prepared on each unit of the course.

Guided Self-study

There are no formal lectures given by the teacher The students have to study the material at their own initiative only. Tutor's help is provided whenever it is needed.

Student-tutored

The IGSI is different from any other kind of programmed instruction because of the very special element of human interaction present in it. It uses students of higher classes for tutoring. Sometimes, the faster students of the same class can be used as tutors. On the average six students are assigned to one tutor.

Self-paced

Different students learn with different speeds. Fast learners take less time to master a given task, while slow learners take longer time. Since students are provided with the material to study at their own, they can study at the pace according to their ability and convenience.

Self-confidence

At the end of each unit, there is provision for self-assessment for trial after studying the whole material on the unit. Since students

have to assess themselves a number of times on all the units, they gain confidence. They can learn any new topic at their own.

Regular Reading Habit

It is a common experience of the teachers that most of the students of mathematics do not read even their textbooks. They simply open the book to read a problem given in an exercise as if the textbook is meant for the teacher only. A teacher always has some limitations. He/she cannot discuss all the points given in the book as per the time available.

Through the IGSI it is obvious that the students have to develop regular reading habit. Once the readinng habit is developed, a student can read any book/material which comes to his/her knowledge on any subject.

Mathematical Reasoning

All books or materials on mathematics are full of mathematical statements. A teacher in the class makes many mathematical statements during his/her lecture but every time it is practically not possible to reason out the statement. In the material developed for the IGSI there is more stress on application and higher objectives. In this system, students are given time to think again and again on each step of a problem, until they reason out themselves. They have to reason 'why' of every step. This inculcates in them logical thinking and develops mathematical reasoning.

Automatic Revision

Mathematics is a sequencial subject. Unless one is clear about the previous units, it will not be possible for him/her to understand the next unit. In the traditional system, the teacher used to explain or repeat or give hints, whenever needed, of previous knowledge, during his lecture to the class. But in the IGSI, in almost all units previous knowledge is very much required. Since students have to study the material at their own, they have to refer to the previous units again and again. This leads to automatic revision of the subject. In addition, sometimes students are required to demonstrate mastery of review units after covering fixed quantum of units.

Instant Reward

After completing self-assessment, students are supposed to take mastery text. The evaluation is both written and oral. As soon as the test is completed by a student, the same is checked by the tutor in his/her presence. He/she need not wait for long time to know the result. Mere acknowledgement of mastery is a reward for the student.

Actual Implementation

The system was tried out in one mathematics section of Class XI of the Central School, Gole Market, New Delhi, during the entire academic year 1982-83. There were two equivalent Sections — A and B in the PCM group. Section A was taught through the traditional system, while Section B through the IGSI. The entire mathematics course for Class XI of the CBSE was divided into 22 small units. The average time for completing each unit was one-and-a-half week. To start with, skeleton study guides were prepared, keeping in view the textual material in mathematics prepared by the NCERT for Class XI. For each unit, a study guide was provided which contained the following :

1. Introduction
2. Objectives
3. Suggested procedure
4. Additional notes
5. Self-assessment

The students took the help of this study guide in order to attain the stated objectives.

Whenever the students had any question on the material, they would come to the class to seek the help of the tutor on an individual basis. When they felt that they were ready, to demonstrate their mastery of the material in the unit, the tutor would administer a test which he would mark immediately in the presence of the students. If the students were unable to demonstrate their mastery, they would re-study the material until they could pass a similar test on the same unit. There no was penalty for repeating a unit test.

The Specifics

Some of the specifics in implementing the IGSI were as below :

Role of the Teacher : The teacher of the IGSI section had a different role than the teacher of the traditional section. The following responsibilities were assigned to the teacher of the IGSI group :

1. To maintain the progress report of each individual.
2. To re-check the mastery test already checked by the tutor.
3. To maintain discipline in the classroom.
4. To explain mathematical concepts to the students when the tutor failed to explain.
5. To formulate and announce the grading policy in the class.

Tutor : The tutors were drawn from mathematics sections of Class XII. The timetable was so adjusted that whenever Section B of Class XI had mathematics period, Class XII (mathematics) had either SUPW, Library, or free period. There were a total of nine periods for Class XI. Two period blocks were provided.

Additional Funds : Practically no additional funds were needed by the school. However, some funds for developing and printing/cyclostyling the appropriate material were needed.

Classroom : No special classroom was required for the experimental group. The same ordinary classroom with sufficient chairs and tables was used.

Time : No extra time was allowed for this group. The time allowed was the same as that for the traditional group.

Mastery Tests : A set of five assessments was prepared on each unit. These tests were in the custody of the teacher. Any of the five assessments could be drawn at random and given to the students who wanted to take them.

Results

At the end of the session, a common examination designed by the CBSE was given to both the sections A and B. The marks obtained by the students of the two sections are shown in Fig. I. These two sections were made equivalent before starting this experiment. It is obvious from the bar chart that :

1. There is a general shift towards right — for the IGSI group.
2. There are more students getting high marks in the IGSI group.

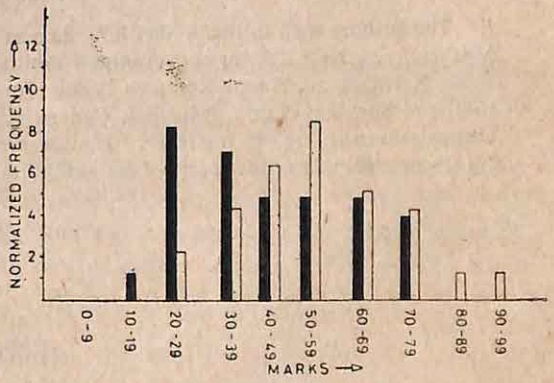

Fig. 1

Comparison of the results of the CBSE examination. Filled bars represent the results of the Traditional System of Instruction and the empty bars represent those of the IGSI System.

3. The IGSI has benefitted low-achievers more.
4. The IGSI has also resulted in significantly better achievement of the gifted students.

The average marks of the students in section A were 43 and of those in section B were 53. This shows an increase of 10 per cent marks which could be attributed to the IGSI.

The general reaction of the students to the IGSI was also favourable. Although the students spent more time in mastering the material, they received the reward of better comprehension of the material. In general, their attitude towards mathematics seemed to have improved.

Conclusion

In general, the IGSI seems to have worked better than the traditional system of instruction. For developing countries like India, having large population, the IGSI seems to have greater prospects. It uses human beings to help other human beings to achieve the same level of mastery thereby democratising education. This system of instruction encourages more personal interactions between students and the tutor, students and the teacher, students and the peer, etc. It is hoped that such interactions would help in bringing about social change in our society. In a rural-based country like India, a central agency could prepare the necessary materials and supply to all parts of the country. With minor modifications, suiting local conditions, the IGSI may be tried for mass education at the senior secondary school level. It may also be tried out in colleges and universities. □

Acknowledgements

The authors wish to thank Shri R.C. Saxena of the Department of Education in Science and Mathematics, NCERT, for encouraging them to try the IGSI in mathematics. They are also thankful to Dr K.J. George, Senior Research Fellow, for his help in preparing materials and in implementation, and Shri Sen Gupta, Principal, Central School, Gole Market, New Delhi for his interest and enthusiasm in trying out the IGSI. Thanks are also due to Smt. A. N. Siddiqui, Class Teacher (mathematics) of the same school for actual implementation of the project in the classroom.

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Relating Creative Thinking Abilities with Academic Achievement and Teaching Skills of Student-teachers

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DEVELOPMENT of creative thinking abilities among students, teachers, or any other group in society does not need any justification at the present stage of our knowledge. By now it has been well realized that, like intelligence, creativity is also a highly valued human ability which has played a crucial role in bringing mankind to its present position.

As regards the question of achievement of students in different school subjects, research studies have highlighted the role of creative thinking abilities in this direction. Getzels and Jackson (1968) in their study of highly creative and highly intelligent adolescents found that the creative group achieved as high as the intelligent group although there was a difference of 23 points of IQ between them. Torrance (1969) reported that the above finding of Getzels and Jackson was confirmed by him in a number of studies.

However, studies exploring the relationship of creative thinking abilities of teachers with their academic achievement and teaching skills are conspicuously lacking. The present study is an attempt to fill this gap.

Sample

Sample for this study consisted of two groups of student-teachers — one called the

* Using the same sample as taken by the author in his doctoral work (Singh 1977) he has further extended his work in this study by collecting and analysing fresh data on academic achievement and teaching skills of his subjects.

creative group (N=89) and the other the non-creative group (N=89) — selected from the total number of 442 B. Ed. students in the city of Lucknow. The creative group included the subjects in the top 20 per cent of creativity measures and those in the non-creative group were the subjects in the bottom 20 per cent on these measures.

Tools

The following six tasks from the Torrance Tests of Creative Thinking (TTCT) were administered to identify the creative and non-creative subjects : (1) Product improvement, (2) Unusual uses, (3) Unusual questions, (4) Just suppose, (5) Picture completion, and (6) Lines. The first four of these are designed to measure verbal creativity while the last two are meant for measuring non-verbal creativity.

University examination marks for the B.Ed. degree were taken to be the measures of academic achievement and teaching skills. Since separate divisions are awarded for the theory and teaching practical examinations in this class, the same were noted down from the examination records.

TABLE 1

Divisions Obtained by Creative and Non-creative Groups in the Theory Examinations

Divisions	*Number of Subjects*	
	Creative Group	*Non-creative Group*
	(N=87)*	*(N=82*)*
I	—	—
II	59	26
III	28	56

$X^2 = 22.01$; df = 1; Signicfiant at .01 level

* Two subjects from the sample of 89 creative and seven subjects from the sample of 89 non-creative were omitted because they did not appear at the annual examination.

Note : the Table entries in the first category being nil, the Chi-square was computed only for the next two categories (the df being reduced to 1 accordingly).

Results and Discussion

Table 1 presents the summary of the data pertaining to the theory examinations of the subjects. There are five compulsory theory papers in the B.Ed. class in this University. The divisions reported in Table 1 are based on the aggregate marks obtained by the examinees in these papers.

It is obvious from Table 1 that none of the subjects in the two groups got a first division in theory. Comparison between the two groups with regard to second divisions reveals that the creative group included more than twice as many second divisioners as the non-creative group. To put it in other words, the majority (69 per cent) of the academically brighter student-teachers belonged to the creative group rather than the non-creative group (31 per cent). This strong association of creativity with academic brightness is further confirmed when comparison is made between the two groups with regard to third divisioners. Here the non-creative group included twice as many third divisions as the creative group. That is to say, the majority (67 per cent) of the academically poorer student-teachers belonged to the non-creative rather than the creative group (33 per cent). This means that the creative abilities have close ties with the academic achievement of the student-teachers. The value of chi-square in this analysis (22.01) proved to be statistically significant at .01 level.

Data regarding teaching skills of the subjects are summarized in Table 2. In their practical examinations, each examinee of the B. Ed. class has to deliver two lessons of 100 marks each in any two of the school teaching subjects. The division is awarded on the basis of aggregate marks obtained in these two lessons.

As Table 2 shows, out of the ten subjects who got a first division, eight belonged to the creative group and only two came from the

TABLE 2

Divisions Obtained by Creative and Non-creative Groups in the Teaching Skills Examinations

Divisions	*Number of Subjects*	
	Creative Group	*Non-creative Group*
	(N=87)*	*(N=82*)*
I	08	02
II	72	72
III	07	08

$X^2 = 3.94$; df = 2; Not significant.

* Two subjects from the sample of 89 creative and seven subjects from the sample of 89 non-creative were omitted because they did not appear at the annual examination.

non-creative group, i.e., a ratio of 4 : 1. But in the case of second and third divisioners the differences between the two groups are not so clear-cut. Almost equal number of subjects were found to be from each of these groups. Value of the chi-square in this analysis did not reach a level of statistical significance.

The above position of the findings with regard to teaching skills may be interpreted in a number of ways. A much higher incidence of first divisioners in the creative group as compared to the non-creative group and almost equal number of second and third divisioners in the two groups may be taken to mean that in the performance of teaching skills creative abilities play their distinctive role only beyond a certain level of performance. Another explanation may be that the type of teaching that we expect our B. Ed. students to practise during their training course is far from being creative. As the writer has pointed out elsewhere (Singh 1974), our whole programme of student-teaching is dominated by a philosophy of authoritarianism with undue dominance of such thing as a completely structured model of lesson plan designed after the famous Herbartian steps, a rigid attitude on the part of the supervisors towards certain classroom practices such as discipline and freedom, an appreciation for classroom questions which are close-ended or pin-pointed rather than thought-provoking, etc. These things, to be sure, are contrary to the principles for nurturing creativity. And, as such, the results of the present study showing a weaker association between creative abilities and teaching skills should not be taken with surprise. A third explanation would cast a serious doubt on the present system of evaluation of teaching skills in our B.Ed. programmes. As contrasted with the theory examinations in which there are five different examiners, each examining a separate paper independently, with the result that their pooled opinions on a candidate are likely to yield an objective evaluation, here in the practical examination, the teaching skills of a candidate are evaluated by a panel of examiners who give their joint evaluation of the candidate in consultation with each other, with the result that there are greater possibilities of this evaluation being unduly affected by the subjectivity and bias of the convener or other influencial member of the panel. Current tendency to influence the practical examiners through diverse means is yet another fact to be borne in mind in the present context. It may be that the observed differences between the two groups are the outcome of one or more of the above-mentioned reasons.

However, each of the above hunches is a point for further investigation. They need to be subjected to empirical verification by the future research workers so as to throw further light into this area. It may be quite interesting, too, to test some of these hunches. □

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Book Reviews

Guidance and Counselling in Colleges and Universities. S. K. Kochhar, Sterling Publishers Pvt. Ltd., New Delhi, 1984, pp. 462, Price : Rs 26.00.

WHEREAS several books on guidance and allied topics in connection with secondary education have been published in India, this volume on *Guidance and Counselling in Colleges and Universities* is one of the few Indian publications connected with post-school education. From this point of view, the book is a welcome addition to the professional literature on the subject.

The book, containing 19 chapters and eight appendices, provides information on guidance and counselling which would be useful to guidance workers at the university level. It is, however, marred by certain errors and omissions. In the Preface, the author mentions that Part I deals with different facets of the guidance and counselling programme. Part II deals with the principal characteristics of psychological tests, and Part III with different types of tests. However, the table of contents shows that the book is divided into only two parts.

Part II dealing with psychological tests consists of over 200 pages, almost half the total number of pages in the volume, whereas Part I dealing with such matters as concepts of guidance, organization of guidance services, and evolution of guidance in India, consists of a little less than half the number of pages. This is a matter of concern to the reviewer, as it clearly indicates that Kochhar's approach to guidance and counselling is heavily test-centered and not developmentally-oriented.

Chapter 1 entitled "Evolution of Guidance and Counselling Movement in India" gives a good historical account, but for want of any references at the end of the chapter or in the

footnotes, the reader is not able to trace the sources nor check the validity of the information. A few important omissions are also noticed. For example, while tracing the development of guidance in the country, the role of private guidance agencies such as the Parsi Panchayat Vocational Guidance Bureau, some bureaus organized by missionaries, the Guidance Wing of the Gujarat Research Society, and the YMCA, in the early years after Independence, has not received any mention. The role played by the national professional body, viz. the All India Educational and Vocational Guidance Association, has received only a cursory mention.

In Chapter 2 on "Guidance and Counselling : Nature, Need and Functions", basic concepts have been brought out very well. The need for guidance at the college level has been illustrated through the findings of studies on Indian subjects. However, a few studies in this area, such as the *Employment Survey of Alumni of Delhi University* and *Pattern of Graduate Employment*, both brought out by the Directorate General of Employment and Training, have been omitted. The development function of guidance has also been discussed, but its practical implications for guidance programmes have not been brought out in the later chapters devoted to programmes and techniques.

In Chapter 3 on "Areas of Guidance", problems experienced by students in various areas of their scholastic, family and social life have been given adequate coverage, but the interrelated nature of all these problems has not been brought out. A few case studies to illustrate the problems and their interrelatedness would have made this chapter more useful.

Chapter 4 gives a comprehensive account of various guidance and counselling services which a college or university can offer to its students. In the list of services, however, the author goes beyond the scope of guidance services and includes admission services. The latter, being concerned with policies and criteria of admission, represent an administrative and not a guidance function. If the book had dealt with Student Personnel Services, and if the author had shown how admission services could be made student-centered, the inclusion of admission services in such a book would have been justified. Information regarding admission policies and procedures can form a part of guidance services to secondary school students and may be included in what the author calls "Pre-admission Service". Selection procedures cannot be considered a part of guidance services.

In Chapter 5 the functions and responsibilities of the guidance and counselling personnel in a college or university have been described quite well, and their contribution to the total guidance service has been shown adequately. However, the training aspect corresponding to these functions has not been dealt with. Information regarding the training required, at least the training of the Counsellor, the Liaison Officer, and the Warden, should have found place in this chapter, as also information as to where such training is available.

Chapter 6 deals comprehensively with occupational information, its coverage, filing, and methods of dissemination. An unfortunate omission here is that the psychological and sociological aspects of occupations have not been discussed at all. A discussion of the various methods of classifying occupations, their strengths and shortcomings, would also have added to the value of the chapter.

In Chapter 7 the author has presented basic concepts in the area of vocational counselling, viz. vocational development, vocational choice, vocational adjustment,

and vocational maturity. The exposition is quite good, but this reviewer finds the following statement, referring obviously to vocational development, to be an exaggerated one : "Very often this development can be traced to the influences exerted *before* birth" (page 102, italics reviewer's).

Chapters 8, 9 and 10 deal specifically with guidance and counselling at the college level. Chapter 8 makes suggestions for organizational structure for guidance service in diffenrent types of institutions of higher learning. The author's use of the term 'Counselling Officer' in this context is not a happy one, as the connotation of the term 'officer' is not in harmony with the generally accepted concept of a counsellor's role, and smacks of a bureaucratic set-up and way of functioning. For every university or large college, the author has proposed one or more counselling officers, depending upon the size of the student population, supported by clerical staff. But she has not shown their relationship to the staff of the Employment Information and Guidance Bureaus and the Student Advisory Bureaus, which have been in existence for several years. The functions of the proposed counselling centre are described in general terms of guidance and counselling assistance to individuals and small groups, but here again they have not been dovetailed with the functions already performed by the two above-mentioned guidance bureaus.

Chapter 11 presents a historical and descriptive account of the University Employment Information and Guidance Bureaus and the Student Advisory Bureaus. Here, too, the author has not shown how their functions can be coordinated with those of the proposed Counselling Centre.

In Chapter 10 the author has brought out the relationship between the world of work and university education. However, the modern concepts of career education and education for life-style have not been discussed. The author could have shown how these concepts can be implemented through the various educational and guidance programmes of the university.

Although the author has drawn her material from several sources, Indian and foreign, these are very often not mentioned by way of proper references (author, year, page also in the case of quotations) either in the paragraphs or in a list of references at the end of each chapter. Only a few references have been given in footnotes. Although there is a bibliography at the end of the book, it is very incomplete, and even several of the publications and authors mentioned in the text do not find a place in the bibliography. At places the names are incorrectly given (e. g. Khorshed, A.W. instead of Wadia, K.A.), and incorrectly spelt (e.g. Mehdi, Beger instead of Baqer). The standard format for bibliographical entries has not been followed, nor is there even consistency in the format from one entry to another. There is neither an author index nor a subject index. This reviewer finds such evidences of slipshod work inexcusable, and a blot on a book which, in several other ways, is of an acceptable standard. □

PERIN H. MEHTA

Effective Classroom Management: A Teachers' Guide. Laslett, Robert and Smith, Colin. Nicholas Publishing Company, 1984, pp. 119, Price : £ 11.95.

MANAGEMENT in classroom remains the primary concern of classroom teachers. How to manage a classroom full of impulsive pupils ? How to organize the presentation of subject matter so that each child will learn from it ? These are some of the problems

of that fresh teachers can been puzzled with. Thus, management of classroom is an important domain of classroom instruction. The teacher performs mainly two types of activities, i.e. substantive instructional activities and managerial activities. Both are complementary to each other. It is only after managing a class properly that the teacher can perform instructional activities. Good classroom management produces a high rate of work involvement with a low rate of deviancy on academic setting. It is usually confused with classroom control, but it is much more than that. The book *Effective Classroom Management* covers comprehensive management and not merely control mechanism.

The book carries nine chapters. Chapter one specifies "Four Rules of Classroom Management" for successful teaching. *Get them in* requires attention to planning the start of each lesson which involves greeting, seating and starting. *Get them out* is concerned with concluding of the lesson or one activity. If the teacher has not thought out the sequence for ending one activity and preparing for another, he will unnecessarily confuse the pupils. *Get on with it* refers to the lesson itself. Content, manner and organization of the lesson should be appropriate to the pupil level as it ultimately sets the tone of the classroom. *Get on with them* is concerned with good pupil-teacher relationship which tends to solve the problem of indiscipline. The teacher should know his pupils. This recognition shows interest on the part of the teacher.

Chapter two emphasizes "Maintaining a Peaceful Classroom Atmosphere" which is essential for effective teaching. The teacher is expected to know the sources of friction like noise, equipment, movement, and chatter. If handled inappropriately, they can lead to major confrontation, resulting in disruption in teaching. He should establish a few essential rules and clarify about the acceptable code of conduct for the pupils. The pupils need to be made fully aware of the same. The chapter further deals with the techniques for maintaining peaceful classroom atmosphere as planned ignoring, signal interference, proximity control, interest boosting, and hurdle help. The activities are in hierarchical order and need to be matched to managerial goals.

Chapter three on "Expectations and Organization" describes how the teacher's expectations differ from one student to another. The teacher's expectations affect his own behaviour as well as that of the students which ultimately affect student outcomes. Lesson organization and its presentation make classroom environment. It captures the pupil's interest. The teacher can convey positive expectations through efficient lesson planning.

Chapter four purports to explain the technique of behaviour modification, that is, reward and punishment. There are two systems for giving rewards. The first system, token economy, is best suitable for groups, and the second, contingency contracting, is meant for individuals. The authors have discussed both the systems with their drawbacks. Punishment is almost discarded by educationists and psychologists as it hinders student growth. It should not be used unless all positive efforts prove unsuccessful.

In Chapter five on "Helping Colleagues Cope", the authors have made an attempt to motivate teachers to help each other specifically with a view to making each other better classroom managers. The chapter is mainly addressed to senior teachers, heads of departments or others who have the responsibility for guiding less experienced colleagues. Consultant teachers need to bear in mind a set of questions when responding to a call for advice

about classroom management. The advice should be simple, direct and practical.

Chapter six on "Teacher Stress" deals with the genuine problem of teaching. Almost every teacher gets the experience of disruptive pupils which gives rise to stress. He feels frustrated and irritated. As the degree of frustration increases, it leads to anger. His anxiety level also increases. As a result, the teacher loses his confidence and gets confused in his thinking and actions. Anxiety is a major cause of disruptive behaviours in the classroom. The teacher should be given some guidance on how to cope with the feeling of irritation, frustration, or anger.

Chapter seven, "Imperturbable, Resilient and Irritating Teachers", is concerned with observations of classroom management of teachers teaching mathematics, craft, and geography. The teacher's positive attitude towards the children are fundamentally important as the techniques become effective only when supported by them. The children pick up cues to disruptive behaviours from indifferent teachers.

The last two chapters, Confrontation in the Classroom, keep in focus the problem children and the strategies to deal with them. How can a teacher avoid confrontation ? An anxious teacher deliberately provokes children, thereby creating a situation of confrontation. There are children also who have the strong tendency to provoke confrontation, but the teacher should be aware of such children in the class. Avoiding public denigration of a problem child, ignoring his behaviour, and avoiding physical intervention can help in avoiding confrontation.

The book is a really good attempt to describe effective classroom management practices which are supported by a number of theories and success anecdotes. The lucid language interspersed with examples further increases the book's appeal. It is primarily based on a teacher's personal experience which any teacher can face at any time in a classroom setting. It is a well-known fact that classroom practices are improved by studying what others do successfully and understanding the principle on which their practices are based. The book provides guidelines to the teachers who are working as teachers at the primary level, or who are just entering the field as teachers. It is equally useful to the teacher-educators who prepare primary teachers. A readable book, indeed ! □

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